

The impact of digital accessibility on the user experience of people with cognitive impairments

Volkman A., Technische Hochschule Ingolstadt, Germany,
[ORCID 0009-0001-0441-0416](https://orcid.org/0009-0001-0441-0416), annika.volkmann.01@gmail.com

Eller E., Technische Hochschule Ingolstadt, Germany,
[ORCID 0000-0001-5151-3541](https://orcid.org/0000-0001-5151-3541), eric.eller@thi.de

Hennighausen C., Technische Hochschule Ingolstadt, Germany,
[ORCID 0009-0008-3703-9079](https://orcid.org/0009-0008-3703-9079), christine.hennighausen@thi.de

Received: 2025-04-15 | Accepted: 2025-09-09 | Publication: 2025-11-11

Abstract: The Internet has become an essential part of everyday life and plays a central role in accomplishing various tasks. Despite existing guidelines and laws on digital accessibility, people with disabilities repeatedly encounter barriers on the Internet that make it difficult for them to use. This work examines the importance of accessible websites and aims to compare the normative guidelines of digital accessibility with the real-world experiences of users with cognitive impairments. To explore how specific aspects of digital accessibility affect the user-friendliness of websites for people with cognitive impairments, we conducted a qualitative study. Twelve semi-structured interviews were carried out to examine the target group's response to three websites that differed in their level of digital accessibility. Three aspects of digital accessibility were examined in more detail: a) easy-to-read language, b) consistent navigation, and c) pause, stop, and hide. The results show that easy-to-read language and clear navigation significantly improve user-friendliness, while moving content has no negative influence. The study results make it clear that there is a lack of understanding of how people with disabilities perceive digital accessibility. The findings of this study can help promote the development of further guidelines for designing accessible websites and enable the digital participation of all users.

Keywords: digital accessibility, cognitive disability, usability, web content accessibility guidelines

1. Introduction

The Internet is an essential part of daily life and plays a central role in education, work, and social participation (Schuppener et al., 2019). However, despite existing legal frameworks and accessibility guidelines, people with disabilities continue to face substantial digital barriers (Botelho, 2021; WebAIM, 2024). This is particularly true for individuals with cognitive impairments, who have long been underrepresented in accessibility research (WebAIM, 2008). This study addresses the gap between normative guidelines and actual user experiences by examining how people with cognitive impairments perceive and navigate websites with varying levels of accessibility. To this end, it investigates how specific accessibility features, i.e., a) *easy-to-read language*, b) *consistent navigation*, and c) *the ability to pause or hide moving content*, impact the perceived user-friendliness of websites for this target group. The central research question of this study is how selected aspects of digital accessibility affect website user-friendliness for individuals with cognitive impairments.

1.1. Basics of digital accessibility

Digital accessibility refers to websites, apps, and technologies that are designed and developed to be accessible to people with disabilities without relying on external support. It is about enabling users to perceive, understand, navigate, and interact with the Internet, regardless of their limitations (Hortizuela, 2022). Cognitive impairments affect various neuronal functions such as perception, memory, language, attention, problem-solving ability, and understanding (Hortizuela, 2022; Seeman & Lewis, 2019). These functional disorders of the brain can be present from birth or the result of adverse events such as an accident or illness, and often remain for a lifetime. The group of people with cognitive impairments comprises individuals with mild learning difficulties, who are often able to live independently, but also those with severe impairments who require extensive support (Cleveland Clinic, 2023). Cognitive disabilities include intellectual disabilities, developmental disabilities, learning disabilities, dyslexia, autism spectrum disorders, mental illnesses, stroke, Alzheimer's disease, and other forms of dementia (Braddock et al., 2013; Hortizuela, 2022; Szabó et al., 2023).

This research focuses on individuals with a learning disability, which is diagnosed when a person shows difficulties in certain areas of school, such as understanding and applying listening, speaking, or writing skills (Hammill et al., 1988). There is, however, no universally accepted definition of this disability, and no precise IQ scores indicate a learning disability (Siegel, 1989, 1999). In the current study, it is often argued that IQ tests do not help diagnose learning disabilities since, in addition to the above-mentioned difficulties, learning disabilities also include mental and developmental limitations in the thinking, remembering, or judgment processes (Blazeska-Tabakovska et al., 2019; Siegel, 1989).

1.2. Internet use by people with cognitive impairments

People with cognitive impairments use the Internet for the same reasons as people without cognitive disabilities: they want to accomplish everyday tasks and engage in activities relating to social participation and personal development. This digital participation covers various areas, such as education, searching for information, entertainment, and building social relationships (Shapiro & Rohde, 2020). One purpose of Internet use is communication: Many use the Internet to stay in touch with family and friends through social media, email, or dating platforms (Glencross et al., 2021; Sallafranque-St-Louis & Normand, 2017). Furthermore, entertainment options such as watching videos, listening to music, and playing online games are common activities the Internet is used for (Ågren et al., 2020; Turner, 2023). The Internet also allows individuals with cognitive impairments to develop their cognitive abilities, such as reading and writing, and enables the expression of personal and romantic needs, for example, through online dating apps (Turner, 2023; Vouglanis & Drigas, 2022). These diverse uses of the Internet show that it plays an essential role in the everyday lives of people with cognitive impairments, just as it is an essential aspect of everyday life for people without disabilities today.

So far, little research has been conducted when it comes to digital accessibility for people with cognitive impairments. This is partly due to the diversity and complexity of the needs of this target group (Small et al., 2005). The barriers experienced online also depend heavily on the type of disability, the web content used, and the goal of usage (Berger et al., 2010). Many users leave websites due to a lack of accessibility (Conway & Mace, 2019). For example, understanding content is a frequently mentioned barrier on the Internet, as many websites use complex language or contain too much information, which makes texts difficult to understand (Dirks et al., 2020).

The barriers that people with cognitive disabilities face online further include difficulties in navigating and orienting themselves on websites (Chadwick et al., 2013). Many options, such as cookie notices, pop-up windows, or advertisements, can confuse and distract the user (Youngsun et al., 2010). Navigating the Internet often requires an in-depth understanding of interactive processes, such as long click paths to get to the desired destination on the website (Chadwick et al., 2013). Complex user interfaces and confusing website structures can make orientation even more challenging (Youngsun et al., 2010). Furthermore, audio-visual content is often inaccessible. Videos without subtitles or content with poor contrast make it difficult to grasp information, especially on small smartphone screens (Bundesministerium des Innern und für Heimat, 2024d). Screens that are visually overloaded with numerous elements, pop-up windows, and animations are distracting and make it difficult to identify relevant information (Chadwick et al., 2013; Marx & Bremer, 2024).

1.3. Guidelines and policies for digital accessibility

Several guidelines and regulations in the European Union govern the rights of disabled people with the aim of enabling them to participate digitally. The Web Content Accessibility Guidelines (WCAG) of the World Wide Web Consortium (W3C) are the basis for many national and European laws (W3C, 2024). Two of the most important regulations in the EU are the EU Directive 2016/2102, which covers the accessibility of websites and mobile applications of public authorities, and the European Accessibility Act (Directive 2019/882; European Union, n.d.; European Commission, n.d.). The European Accessibility Act obliges EU member countries and, starting in 2025, will introduce an obligation for private providers of certain products and services, such as e-commerce and banking. National legislation will implement this regulation (Bundesfachstelle Barrierefreiheit, n.d.). In addition, the EN 301 549 standard defines specific accessibility requirements that serves as a reference for implementing the above-mentioned EU directives. It is primarily based on the WCAG but includes additional requirements for other information and communication products, such as operating systems, self-service terminals, and communication services (European Commission, 2021).

To make the web accessible to everyone, in 1999, the World Wide Web Consortium (W3C) published the Web Content Accessibility Guidelines (WCAG; Hellbusch & Probiesch, 2011). The current version, WCAG 2.2, has been in effect since October 2023. However, only a few guidelines of the WCAG are currently specifically adapted to people with cognitive disabilities or learning disabilities (Bundesministerium des Innern und für Heimat, 2024c; W3C, 2024).

The WCAG comprises principles, guidelines, success criteria, and techniques. The four principles, that is, perceivable, operable, understandable, and robust, serve as the basis of accessibility on the web (Bundesministerium des Innern und für Heimat, 2024c; Hellbusch & Probiesch, 2011). Perceivable means that information is accessible through at least two sensory channels. Operability refers to using the website, e.g., with a keyboard, straightforward navigation, and avoiding flashing lights or sounds. Understandability describes easy-to-read content and simple language. Robustness relates to compatibility with screen readers (Bundesministerium des Innern und für Heimat, 2024b). The four principles are supported by thirteen guidelines and are supposed to define web developers' goals and frameworks. These guidelines are not testable; however, they make it easier to understand the success criteria and techniques (Bundesministerium des Innern und für Heimat, 2024b; Hellbusch & Probiesch, 2011). Moreover, testable success criteria are defined for each guideline. The 61 testable success criteria are further divided into three levels of conformity, providing concrete instructions for implementing accessibility. These three levels of conformity, that is, A, AA, and AAA, each define a specific

degree of accessibility (Hellbusch & Probiesch, 2011). Finally, there are numerous techniques for each of the guidelines and success criteria to implement the minimum requirements of the three levels of conformity (W3C, 2024).

The concepts of plain language and easy-to-read language have different origins. Plain language is used in the legal and administrative context with the goal of making texts easier to understand for the general population (Vollenwyder et al., 2018). Plain language tries to make the content easily understandable by avoiding long and complex sentences. Within the WCAG, plain language is indirectly addressed through success criterion 3.1.5 Reading Level (Level AAA) (W3C, 2024). Easy-to-read language was specifically developed to meet the needs of people with cognitive disabilities (Hellbusch & Probiesch, 2011). Easy-to-read language, however, is not explicitly included in the WCAG. Nevertheless, it represents the most relevant and helpful linguistic concept for people with cognitive impairments, as it provides the highest level of accessibility for this user group (ISO – International Organization for Standardization, 2023). Both plain language and easy-to-read language have the goal of improving text comprehensibility by removing linguistic barriers (Vollenwyder et al., 2018).

Easy-to-read language is a way of expressing oneself that is, in particular, well understood by people with learning disabilities (Hellbusch & Probiesch, 2011). It reduces linguistic barriers and expands the range of information that users can understand and use (ISO – International Organization for Standardization, 2023). A set of rules for easy-to-read language specifies that simple words should be used, words such as ‘not’ or ‘no’ should be emphasized in bold, and sentences should be written on one line, if possible, without commas, for example (Bundesministerium des Innern und für Heimat, 2024a). Easy-to-read language is not explicitly regulated in the WCAG (W3C, 2024). A text in easy-to-read language is usually checked by experts, either trained specialists or affected persons with learning disabilities (Hellbusch & Probiesch, 2011; MSKTC.org, 2014).

Consistent Navigation belongs to the WCAG principle “Understandable” and the guideline “Predictable”. It is assigned to the conformity level AA (W3C, 2024) and specifies that navigation should be consistent and always available throughout the website to make finding content easier. When testing this success criterion, different website areas are opened from the home page using different navigation paths (BIK BITV-Test, n.d.-b). An accessible website requires multiple ways to find content and meaningful headings and labels that help users locate content and understand their position on the website. A good navigation concept should enable an intuitive orientation on the website (Hellbusch & Probiesch, 2011).

Pause, Stop, Hide relates to the conformance level A according to the WCAG and can be assigned to the principle of operability and the guideline “Enough Time”. It is specifically relevant for people with learning disabilities since moving content, such as videos, animations, or flashing text that plays automatically, can distract from other information (Marx & Bremer, 2024). Such content should either be limited to five seconds, or it should be possible for the user to pause, stop, or hide it (BIK BITV-Test, n.d.-a; Blazeska-Tabakovska et al., 2019; Hellbusch & Probiesch, 2011). Pause, Stop, Hide is checked by verifying whether a button is available to stop the movement or clear instructions are given for keyboard control. It must be ensured that the movement does not restart after a certain period (BIK BITV test, n.d.).

1.4. Research objectives and hypotheses

The central research question of this study is: How do selected aspects of digital accessibility affect the user-friendliness of websites for individuals with cognitive impairments? To answer this question, five hypotheses were developed based on prior research and accessibility guidelines.

People with cognitive impairments use the Internet for a wide range of purposes, including communication, entertainment, and information-seeking (Ågren et al., 2020; Glencross et al., 2021, Sallafranque-St-Louis & Normand, 2017, Shapiro & Rohde, 2020). These activities are central to digital participation and underline the importance of accessible online environments for this group.

H1: Despite their limitations, people with cognitive disabilities actively use the Internet for social interaction, entertainment, and information.

Easy-to-read language has been shown to improve the comprehensibility of texts for people with cognitive impairments (Vollenwyder et al., 2018; ISO, 2023). While WCAG guidelines emphasize understandability, they do not yet include formal requirements for easy-to-read language. This leaves a gap in practice, especially for users who struggle with complex syntax and vocabulary.

H2: Websites written in easy-to-read language are easier to understand for users with cognitive impairments.

Difficulties in navigation and orientation are among the most common barriers reported by users with cognitive impairments (Chadwick et al., 2013). Previous studies have found that predictable, consistent navigation structures and clear labels help users understand where they are on a site and how to proceed (Blazeska-Tabakovska et al., 2019; Hellbusch & Probiesch, 2011).

H3: Consistent and clearly structured navigation helps users with cognitive impairments to orient themselves more easily on websites and reduces confusion.

Moving elements such as auto-playing slideshows or animations can distract users with cognitive impairments and impair task focus (Chadwick et al., 2013; Marx & Bremer, 2024). WCAG therefore recommends options to pause, stop, or hide moving content. Even though this aspect of digital accessibility is already included in the WCAG, there is still a lack of in-depth research on how people with cognitive impairments use these websites in real life and what barriers they have to encounter (Gartland et al., 2022).

H4: The ability to pause, stop, or hide moving content helps people with cognitive disabilities avoid distractions.

Finally, digital accessibility enables users with disabilities to perceive, understand, navigate, and interact with the Internet, regardless of their limitations (Hortizuela, 2022). However, empirical research has shown that the mere presence of accessible features does not always translate into a better user experience (WebAIM, 2008; Chadwick et al., 2013). Comparing websites with different accessibility levels thus offers insight into which features truly matter from the user's perspective.

H5: Websites with higher levels of accessibility are perceived as more user-friendly by individuals with cognitive impairments.

2. Method

The study aimed to test the perceived digital accessibility of websites with different levels of digital accessibility. For this purpose, semi-structured interviews were chosen because they combine a clear structure with the flexibility to adapt to individual communication needs. This was particularly important for participants with cognitive impairments, allowing them to express their thoughts freely while ensuring comparability across cases. Creating an open discussion situation was important to gain detailed insights into the perspectives and experiences of people with cognitive impairments, especially with learning disabilities. Three aspects of accessibility were examined in more detail: a) Is the website available in easy-to-read language? b) Is there a predictable and consistent navigation? and c) Is there an option to pause, stop, or hide content that flashes or moves? The perception of user-friendliness of participants with learning disabilities was assessed through tasks that focused on the above-mentioned aspects of accessibility.

An interview guide was created to ensure comparability between the interviews. Before the actual study, a pretest was conducted to check the suitability and comprehensibility of the interview guide.

2.1. Sample

Twelve interviews were conducted with three women and nine men aged 18 and older who had been diagnosed with cognitive disabilities to achieve data saturation (Hennink & Kaiser, 2022). Prior to the interviews, the participants were not tested for their IQ, nor were they asked about their exact learning disability since the participants often did not receive a more specific medical diagnosis. Nevertheless, it was possible to speak of a learning disability since all of them had impaired intelligence, which was confirmed by the supervisors. The individuals had difficulties learning, thinking, and remembering and could not concentrate on a task for an extended period (Blazeska-Tabakovska et al., 2019; Hortizuela, 2022). The requirements for participating in the study were that the participants (1) knew the Internet and (2) had used it in the past. Furthermore, it was necessary that the interviewees (3) could read and (4) write. All twelve participants fulfilled these requirements. Recruitment occurred by contacting various local institutions, whereby supervisors suggested suitable participants. The interviews took place in the interviewees' residential or work facilities to ensure a familiar atmosphere.

2.2. Materials

The selection of the websites examined was based on empirical findings suggesting that participation in leisure activities can improve cognitive functions and quality of life in people with cognitive disabilities (Heister et al., 2023). In addition, studies showed that the Internet plays a central role in the everyday life of this target group (Shapiro & Rohde, 2020). It could be concluded that the Internet and participation in leisure activities serve entertainment purposes, social participation, and information gathering (Glencross et al., 2021; Sallafranque-St-Louis & Normand, 2017). Therefore, an accessible website to inform oneself about a leisure activity is essential for digital inclusion. Despite this relevance, there is limited research on which websites in the leisure sector are actually used by cognitively impaired individuals (Heister et al., 2023). To conduct a study that is as realistic as possible, three leisure websites were selected that differ in their degree of accessibility. The selection was based on the following criteria: firstly, the website had to be highly relevant for cognitively impaired individuals. Secondly, accessibility standards were ensured to varying degrees to identify differences in perceived user satisfaction. Finally, a leisure area that appeals to a broad user base was chosen to comprehensively analyse possible

barriers and potentials for cognitively impaired individuals. The final decision was discussed and confirmed with the participants' supervisors, so that two zoo websites and one outdoor museum website were chosen.

Before the study began, the three websites were evaluated on the key aspects of digital accessibility. The focus was on the criteria of easy-to-read language, consistent navigation, and the option to pause or hide moving images. Publicly available tools such as the WAVE Web Accessibility Evaluation Tool (WebAIM, 2025) and AChecker (Inclusive Design Research Centre, n.d.) were used for objective evaluation. These automated testing tools analyse the websites based on the WCAG guidelines, identify potential problems, and provide recommendations for improving digital accessibility. In addition, a second test process was carried out by BITV-Consult, the official testing centre in the BITV-Test network (Girke, n.d.), and by the agency Gehirngerecht Digital (Gehirngerecht Digital GmbH, n.d.). This enabled the selection of the websites to be validated and the assessment of the accessibility aspects to be confirmed. This targeted approach not only allows individual accessible and non-accessible elements to be identified but also allows their influence on user satisfaction to be systematically recorded. The results of this study provide practical insights into the design of accessible leisure services in the digital space.

2.2.1. Website 1: “High-level accessibility”

Website 1 is theoretically considered a best practice example for an accessible website. It offers a main page in complex language and an additional page in easy-to-read language. The main page features two horizontal primary navigation bars consistent across all subpages. When a user clicks on a category in the lower navigation bar, a dropdown menu appears, indicating the user's current location on the website. The page in easy-to-read language has its primary navigation, displaying the user's current location. Instead of dropdown menus, this page uses a vertical navigation system with embedded links.

2.2.2. Website 2: “Mid-level accessibility”

Website 2 considers some aspects of digital accessibility but has room for improvement. Upon loading the page, an automatically playing slideshow is displayed, which can be stopped by clicking, turning it into a static image. Alternatively, users can navigate through the images using arrows. Like website 1, this website features two horizontal primary navigation bars consistent across all subpages. A dropdown menu appears when a user clicks on a category in the lower navigation bar. However, the current location on the website is not displayed. The upper navigation bar includes a link to a page in simple language and features an eye symbol. This symbol activates an accessibility mode with increased contrast and adjustable font size, which works for both language versions. The page in simple language does not have an own navigation bar. When navigating through the displayed categories, users are redirected back to the page in complex language.

2.2.3. Website 3: “Low-level accessibility”

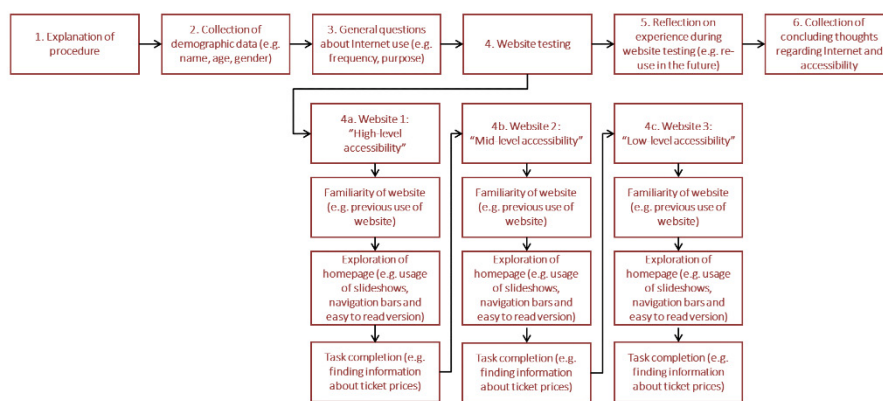
Website 3 has the lowest level of accessibility among the three websites. Upon loading the page, an automatically playing slideshow starts, which can only be temporarily paused by hovering the cursor over the image. A function for permanent pausing is not available. Users can navigate through the images using arrows. The website's navigation is complex and includes a horizontal main navigation bar with a search function and dropdown menus under two categories. These dropdowns lead to five subcategories, each with its vertical navigation bar.

Additionally, a separate vertical navigation bar in the upper right corner contains links that either serve as anchor links or open separate subpages. On subpages, users are guided through a breadcrumb navigation that shows the path from the homepage to the current page. This website does not offer a version in easy-to-read language.

2.3. Study structure and implementation

Participation in this study was voluntary, and participants could quit the interview at any time. The participants signed a confidentiality and informed consent form, which explained the purpose of the study, guaranteed anonymity, and outlined how the data (including video recordings) would be handled. For this purpose, a data protection declaration in easy-to-read language was created. The interview process is described below illustrated in figure 1.

Figure 1: Illustration of the interview process.



First, the procedure was explained to the participants. They were assured that there were no right or wrong answers and that all input would help improve digital accessibility. Demographic data was collected, including name, age, gender, and current living situation. In addition, participants were asked general questions about their Internet use, including frequency, purposes, and perceived advantages and disadvantages.

Second, participants tested three websites with different levels of digital accessibility (high, medium, low). The order was fixed and not randomized. Before beginning, they were asked whether they had used the website before, to control for prior familiarity. Next, participants explored the homepage freely, focusing on key elements such as slideshows and navigation bars. Observations focused on whether users could pause or stop moving content, switch to easy-to-read language versions, and navigate effectively. For each website, participants were then asked to complete tasks such as finding information about ticket prices. When difficulties occurred, support was offered. Third, after testing each website, participants were asked to reflect on their experience, how they felt about using the site, and whether they would consider using it again in the future. The interviews were then concluded with an open-ended question allowing participants to share further thoughts about the Internet and accessibility. Each interview lasted between 45 and 60 minutes. On average, around 10 minutes were spent on each website.

After the interviews, the video recordings were transcribed, anonymized, and analyzed using content-structuring qualitative content analysis (Kuckartz & Rädiker, 2022) with the software MAXQDA (VERBI Software, 2025). In the initial phase, transcripts were reviewed, relevant passages were marked, memos were written, and case summaries were created. In the subsequent stages, a category system with 21 main and 17 subcategories was inductively

developed and applied to the data (see Appendix A). Final interpretation took place in the concluding phase of the analysis.

Ten of the twelve interviews were included in the final analysis. One participant dropped out after the second website, and another required extensive assistance due to nervousness. In the remaining interviews, saturation of themes was achieved. One participant was supported by a supervisor who translated questions into easy-to-read language when needed.

3. Results

Most participants did not experience the situation as stressful or as a test. They often showed a particular pride and great joy that their opinion was being asked for. This made it easy for the participants to answer the introductory questions and report their Internet experiences. It was, therefore, not surprising that all participants answered 'yes' to whether they were interested in the Internet.

3.1. Device and frequency of Internet use

All participants stated in the interviews that their smartphone is their preferred device and that they use it regularly or daily. Half of the participants own a tablet or iPad but rarely use it. The number of people who used a laptop was remarkably low. Only three out of ten respondents use a laptop, often not their own but, for example, one belonging to their parents. One respondent reported having a PC for rare tasks such as printing documents.

3.2. Support with using the Internet

Three of the ten study participants said that they needed support in using the Internet. They mentioned that they are not familiar with the Internet and need support to be more active or get help as soon as they get stuck on a website. This was true for all participants in this study, as some needed help and support during the test. One participant said that:

Mum or Dad help with that, for setting alarms or making appointments, calendars, and other similar tasks. But when it comes to Netflix, my brother helps me (Interviewee 3).

3.3. Positive aspects of the Internet

Half of the participants mentioned the possibility of gathering information as a positive Internet feature. The participants also mentioned that "it is the successes that you get out of it (from a website)" (Interviewee 4) and that they love learning something on the Internet. Another positive aspect mentioned was "that it (the Internet search) is quick when you need something urgently" (Interviewee 5). One respondent said: "Seeing the whole thing (the website) is just fun" (Interviewee 9). From this, it can be deduced that the respondents consider it important to use the Internet smoothly. Two participants mentioned the opportunity to contact people as a positive aspect of the Internet. One respondent preferred WhatsApp "because I have friends there with whom I can write a lot" (Interviewee 8). Another test person found it positive that appointments could be made, saying, "It's always so cool that anyone can write, meet people, or whatever; it's great" (Interviewee 7).

3.4. Negative aspects of the Internet

When asked about negative aspects, it was interesting that none of the participants mentioned barriers while using the Internet. Instead, the issue of security was present for all of them. A total of 60% of the participants reported concerns about interactions with strangers, e.g., through hacker attacks, telephone fraud, or bullying when uploading pictures. Two participants described their own experiences with hacking attacks, but they could prevent the worst from happening by acting correctly.

3.5. First impression of the websites

3.5.1. Website 1: “High-level accessibility”

Important observations about the high-level accessibility of the website were made during the first navigation on the website. The participants mostly noticed the images first, as they were easy to understand without reading about them. Three participants initially focused on the navigation bar. They stated that they first had to “plan their visit” (Interviewee 9) or wanted to “take a quick look” at where they were (Interviewee 6). When shown the option for easy-to-read language, four out of ten participants recognised it. Two of them were positively surprised and relieved that the website offered a version in easy-to-read language, while the others found this less relevant. One participant was particularly enthusiastic:

Easy-to-read language helps many people – whether they are older or have a disability. It helps everyone (Interviewee 3).

Only one participant noticed the option for easy-to-read language without being prompted. This could be because the participants had never used such a function before and did not look for it. One participant was not aware that websites in easy-to-read language even existed. Furthermore, two participants asked what a navigation bar was, and one preferred larger text.

3.5.2. Website 2: “Mid-level accessibility”

The results for the mid-level accessibility website were similar. Here, the images were also the first thing the participants noticed – both on the page with complex language and on the page with simple language. On the page with simple language, some participants noted that real photos would be better than illustrations. One positive aspect compared to the high-level accessibility website was that three participants independently noticed the option for simple language in the navigation bar. It remains unclear whether this is due to a learning effect from the first website or whether the category was better placed on this website. Only one participant recognised the option for simple language when prompted and was surprised by this function. However, the term ‘simple’ was confused, as the participants were more familiar with ‘easy-to-read language’ than ‘simple language.’ One participant expressed this confusion by saying:

I’ll have to look now. It does not say “easy-to-read language” anywhere. How do I get there? Maybe by clicking on “simple”? (Interviewee 1).

One participant who had not recognised the navigation bar on the previous website immediately noticed that “the sentences are up there again. The words. That you can click on them” (Interviewee 6). A particularly positive aspect that was noticed was the font size on the page, which could be adjusted using simple language.

3.5.3. Website 3: “Low-level accessibility”

The participants perceived the low-level accessibility of the website very differently, both in terms of initial navigation and use of the website. One participant appreciated the shorter navigation bar, while another discovered the search function but was disappointed when it did not work reliably. Opinions also differed on the layout of the website. While one participant found it easy to navigate the website, another had difficulties finding their way around and felt overwhelmed. One participant said, “I have to see what is on the website first” (Interviewee 10). When scrolling, they discovered widgets they found very interesting and helpful for orientation because they displayed “both the question and the answer” (Interviewee 10). By this, they meant they could see the main category – like in the top navigation bar – and the corresponding detailed information was displayed directly below it. They did not have to open a new page or navigate through an additional menu, as all the relevant information was available immediately.

3.6. Internet use in the areas of social interaction, entertainment, and information (Hypothesis 1)

The first hypothesis states that despite cognitive limitations in learning, people with cognitive disabilities are interested in the Internet and use it for social interaction, entertainment, and information. The participants said that they use the Internet for a variety of purposes. The interviewees most frequently mentioned WhatsApp (70%), Google (70%) and YouTube (70%) as activities they do on the Internet. It was mentioned that WhatsApp is used to stay connected with friends and family, arrange appointments, or meet new people. Facebook was also mentioned as a platform for staying connected with friends, as the respondents can send and accept friend requests there and congratulate people on their birthdays. These two apps can be categorised as social interaction and communication. Seven participants mentioned that they use Google to search for information. They search for sports results, cinema programs, and news. However, they also google special interests such as recipes on ‘Chefkoch,’ information about holiday destinations, diseases, or plant care instructions. Two people mentioned that they often use the voice function as an additional support. In the entertainment sector, 90% of the participants were able to report something since the social media platforms Instagram (50%), TikTok (30%), and YouTube (70%) are used by the test persons on their smartphones. Some of them post photos or videos themselves. Only two participants use the Internet for shopping, mainly via Amazon, for example, to buy gifts. Furthermore, 40% of the test persons mentioned other topics such as weather forecasts, traffic situations, or apps to learn a language. Since 100% of the participants said they were interested in the Internet and the above results lead to the conclusion that the categories of entertainment, information-seeking, and communication are the main areas of Internet use, hypothesis one can be confirmed.

3.7. Websites in easy-to-read language (Hypothesis 2)

To confirm the second hypothesis, it is assumed that users with cognitive disabilities will better understand a website's content if formulated in easy-to-read language. When searching for ticket prices on the high-level accessibility website, 70% of the participants chose the version in complex language, while only 30% used the version in easy-to-read language. Among those who used the complex language page, only four out of seven completed the task, whereas all participants using the easy-to-read language succeeded. The participants received the large font, short words, and structured layout positively. Comments such as “Yes, this is perfect for reading. It is really good. Perfect for reading” (Interviewee 5) and “because the letters are big enough. And because I can

read it very well" (Interviewee 6) highlighted the high readability of the texts. Participants who compared both versions stated that the page in easy-to-read language was easier to understand. However, three participants noted that the easy-to-read language page contained too much information, making it feel cluttered.

On the mid-level accessibility website, most participants preferred the page in easy-to-read language. All of them found the texts easy to understand, while only two out of five participants could clearly understand the texts in complex language. One participant commented on the version in complex language by saying, "That was difficult" (Interviewee 7), while the same participant read and liked the text in easy-to-read language. Some participants understood the complex language texts but felt that they could be easier to read.

The text is well written and clearly structured – except for that one word I could not pronounce (Interviewee 1).

But I would instead use this page (in simple language) because it is easier (Interviewee 5).

On the low-level accessibility website, which does not offer any content in easy-to-read language, the participants' opinions on text comprehensibility were mixed. While half of the participants understood the content, the other half had difficulties and would have liked to see an extra page in easy-to-read language or a larger font size to improve readability.

The results show that providing texts in easy-to-read language is essential for accessible and user-friendly websites. From the analysis, hypothesis 2 is confirmed.

3.8. Website navigation (Hypothesis 3)

To test the third hypothesis, the participants' orientation on the three websites is analysed and evaluated to confirm that consistent and clear navigation helps cognitively disabled users find their way around a website and reduces the risk of confusion.

On the high-level accessibility website, participants had access to two different navigation bars, depending on whether they used the complex or easy-to-read language version. Half of the participants found navigating the complex language page confusing. A key problem was the drop-down menu, which contained too much information, making navigating difficult. In contrast, four out of ten participants found the easy-to-read language page very clear, especially with simple and unambiguous categories such as 'animals.' One participant commented, "I clicked on 'animals.' Then I saw sheep. That was a bit simple" (Interviewee 7). However, participants had difficulties following longer navigation paths, for example, when searching for ticket prices. Some participants did not recognise the link to the prices. Participants who initially used the page in complex language required significantly more time to orient themselves on the website. They clicked on the wrong categories in the navigation bar more often, which led to confusion. In one case, a participant actively asked for help after losing orientation. However, the same person could immediately find the information they were looking for after switching to the website in easy-to-read language. By contrast, initially, participants who used the page in easy-to-read language had significantly fewer difficulties. They understood the navigational structure more quickly and could complete tasks more efficiently.

The analysis of the mid-level accessibility website revealed significant issues with navigation and clarity. Only one participant rated the simple language page as transparent, while three others criticized it as illogical and described it as "so fragmented" (Interviewee 10). The website in

complex language was also seen as problematic, with five participants expressing concerns about the clarity of the navigation. Because the simple language page was integrated into the navigation of the complex language page, there was only one subpage with a great deal of scrolling depth for participants to use. This design caused many to feel frustrated. The participants expected to find information about ticket prices in the 'Tickets' section of the simple language page. Still, the price information was further down the page, requiring them to scroll down far. As one participant accurately pointed out, "Why don't they put that there? It is silly. They should put it right there (just below the title), not down" (Interviewee 1). The sheer number of ways to navigate the website also caused confusion. Three participants were initially misled by a pop-up that they thought would take them to ticket prices but instead redirected them to the online store, where they gave up on their search. A clear 'pricing' category in the navigation bar would have significantly reduced this problem.

The low-level accessibility website performed better overall, with 60% of the participants rating the navigation as easy. A key advantage was the menu in the upper right corner with the labelled 'Tickets & Prices' category. Half of the participants recognised this immediately and were thus able to find the information they were looking for quickly. However, others who did not notice this navigation bar were more likely to get frustrated and could not find the ticket prices. The website offered too many ways to find the ticket prices. The main navigation with the drop-down menu confused some participants because it displayed too much information simultaneously. The most frequently used menu was in the upper right corner, as one participant explained:

I clicked on it, and the page with all the prices appeared immediately. This is how it should be on every website (Interviewee 6).

Consistent and clear navigation helped people with cognitive impairments navigate the three websites and reduced the risk of confusion, thus supporting the hypothesis.

3.9. Pause, stop, and hide content (Hypothesis 4)

For evaluating the fourth hypothesis, which states that the ability to pause moving content helps users with cognitive impairments avoid distractions, website 2 and website 3 were used, as website 1 does not feature any slideshows.

On the mid-level accessibility website, 40% of the participants were bothered by the slideshow, saying, "The image change is too fast" (Interviewee 1). However, three of these participants knew how to stop the slideshow independently. Most participants (60%) were not bothered by the slideshow and did not feel the need to stop or pause the moving images. One participant commented, "It (the slideshow) is not necessary, but if people like it, why not" (Interviewee 10). The participants were familiar with other platforms, where they could "click through the images with the arrows" (Interviewee 8) at their preferred speed.

The participants who found the slideshow distracting on website 2 had similar concerns about the low-level accessibility website. Four participants found the slideshow distracting, while the remaining six did not perceive it as distracting. The main issues were the fast slide-change speed and the arrows for navigating through the slides, which were only displayed when the mouse pointer was moved over the image. As a result, some participants clicked on the arrows, which took them to the corresponding subpage, but the slideshow did not advance to the following picture. None of the participants realized that the slideshow could be paused by moving the mouse cursor over the picture.

Since most participants did not find the moving content distracting and saw no need to pause or stop it, the fourth hypothesis is not confirmed.

3.10. Comparison of the three websites (Hypothesis 5)

To test hypothesis 5, stating that the higher the degree of digital accessibility of a website, the more user-friendly it is for users with cognitive impairments, participants were asked whether they would use the website again and to describe what they liked or disliked about each website. The goal was to determine whether the website with the highest level of digital accessibility – in this case, website 1 – was perceived most positively by the target group.

However, the results showed a more differentiated picture. While nine out of ten participants said they would use the website once again, several participants mentioned that they would need support to do so. In particular, navigating and finding one's way around the website was perceived as problematic. In the final evaluation of the general user-friendliness of the three websites, only two participants ranked the high-level accessibility website first. In contrast, half of the respondents put it in second place. These results show that although the website is considered accessible in theory, there is still plenty of room for improvement for the target group.

In comparison, the mid-level accessibility website received the most positive feedback. The accessible contrast mode was particularly highlighted as it made using the website easier and better. Only two participants saw no advantage in this mode. No participant rated this website in last place, and three participants even placed it first in the overall usability rating. Eight people would use the website again, with only one saying they would need help.

As with the previous assessments of the low-level accessibility website, the ranking showed quite different results. Five participants rated the website in the first place, while the remaining five put it in the last place. Although it had the lowest accessibility among the three websites, it was voted into first place the most times. However, several barriers were identified that conflicted with aspects of digital accessibility and that participants had to deal with. For example, the ticket shop opened in a new tab, which meant that the universal return button in the upper left corner of the browser no longer worked. Pop-ups distracted participants from their search for information, the animated navigation in the drop-down menu was perceived as too fast, and the search function did not work reliably. Despite these issues, the website impressed some participants with its navigation and overall perception, with seven participants stating that they would use this website again. Only one person said they would need help if they used it again.

In summary, the degree of accessibility alone was not crucial for user-friendliness. Certain aspects of digital accessibility were more important to those affected than others. The hypothesis can, therefore, not be confirmed.

4. Discussion

This study evaluated the three aspects of digital accessibility and perceived user-friendliness on websites. Through a qualitative research design with semi-structured interviews, the following research question was addressed: How do selected aspects of digital accessibility impact the user-friendliness of individuals with cognitive impairments? The observation focused on cognitive disabilities. Given the wide range of cognitive disabilities, this study specifically focuses on individuals with learning disabilities.

4.1. Themes and findings

Hypothesis 1 states that many people have an interest in the Internet despite cognitive disabilities, particularly in the areas of social interaction, entertainment, and information search. The study results confirm this. WhatsApp and Facebook are used for communication, while Google is used for research. Platforms such as Instagram, TikTok, and YouTube are used for entertainment. These findings are consistent with previous studies by Ågren et al. (2020), Glencross et al. (2021), and Sallafranque-St-Louis & Normand (2017). These show that digital media are important for people with cognitive impairments to maintain social contacts, search for information, and enjoy themselves. It should be emphasized that the target group uses the Internet in the same way as people without disabilities. This illustrates the importance of digital inclusion and the need for accessible services.

The study results confirm hypothesis 2: content in easy-to-read language is better understood by people with cognitive disabilities. Previous research shows that complex language creates barriers that can be reduced by easy-to-read language to expand the range of information (Dirks et al., 2020; Vollenwyder et al., 2018). The interviews make it clear that content in easy-to-read language is easier to understand on accessible websites. On the low-level accessibility website, some participants would have wished for a version in easy-to-read language. Easy-to-read language significantly improves text comprehension but is not always sufficient for people with severely limited reading ability. Cognitive competence plays a crucial role. Participants with higher cognitive competence often prefer complex language, which indicates that the needs within the target group vary greatly.

The third hypothesis, that consistent and clear navigation improves user-friendliness for people with cognitive limitations, is confirmed by the interviews. Previous research by Chadwick et al. (2013) and Blazeska-Tabakovska et al. (2019) shows that straightforward navigation improves orientation. The WCAG also emphasizes the importance of consistent navigation in the success criterion 'Consistent Navigation' (W3C, 2024). The interviews confirm that confusing navigation and unclear category labels are perceived as a problem. The WCAG recommendation to offer multiple navigation paths cannot be confirmed by the user tests, which leads to confusion. Instead, accessibility should be achieved through intuitive navigation and meaningful categories. This makes it clear that guidelines such as WCAG must be adapted to the needs of users in order to improve accessibility.

The interviews do not support the fourth hypothesis that the ability to pause moving content helps cognitively impaired users avoid distractions. Studies by Chadwick et al. (2013) and Marx and Bremer (2024) show that animations, overloaded screens, or automatic videos on websites are distracting and make it difficult to perceive relevant information. The WCAG, therefore, recommends limiting such content to five seconds or making it possible to pause it (BIK BITV test, n.d.-a; W3C, 2024). However, most study participants do not find the slideshows distracting or know how to stop them. Even rapid image changes are hardly perceived as distracting. While the WCAG criterion is important for people with epilepsy, it has been shown that moving content is usually not a problem for people with learning disabilities. For this target group, pausing, stopping, or fading out is less crucial for user-friendliness.

According to hypothesis 5, a higher degree of website accessibility should improve user-friendliness for people with cognitive impairments. This hypothesis is not confirmed. The study by Chadwick et al. (2013) shows that people with cognitive impairments often encounter online barriers. Although the WCAG aims to improve user-friendliness, the interviews show a more differentiated picture (Blazeska-Tabakovska et al., n.d.; WebAIM, 2008). The theoretically

accessible high-level accessibility website shows that there is still room for improvement. This is reflected in the ranking of general user-friendliness: only two people put the website in first place, while half of the sample sees it in second place. By comparison, the mid-level accessibility website performs better, with three top rankings and no bottom rankings. It is surprising that the low-level accessibility website, although it has the least accessibility, performs best in the user ratings. This suggests that other aspects of accessibility play a more significant role for users.

Regarding the research question, it can be concluded that individual aspects of digital accessibility have a different impact on user-friendliness for people with cognitive impairments. As the results show, the use of easy-to-read language and clear and concise navigation increases user-friendliness. At the same time, moving images do not have a negative impact on user-friendliness.

4.2. Implications of the results

Using easy-to-read language on websites makes it easier for people with learning disabilities to use them. Easily readable fonts and short, comprehensible phrases are viewed positively. An important suggestion for improving websites is introducing a version in easy-to-read language to reduce barriers. Since such offers are rare, many users are unaware of their existence. To improve digital accessibility overall, more websites should provide content in easy-to-read language.

The study shows that a well-structured navigation is essential for the user-friendliness of websites. A clear and comprehensible categorization is particularly well received, as it simplifies orientation. A clearly visible and logically structured navigation can help users to find information more quickly. To further improve accessibility, websites with simplified language should have a structured navigation bar to avoid long scrolling and to present content clearly and concisely.

There is room for improvement in optimizing moving images on websites. Although slideshows are not perceived as annoying by all users, user-friendliness can be increased by integrating a way to pause or stop them by clicking and keeping the navigation arrows visible. In addition, introducing specific pause and play buttons could provide a simple control option and thus further improve usability.

4.3. Limitations

The sample size and the recruitment of the participants are limitations of this study. The sample size is at the lower limit of what would have been desirable for the study. At least 15 subjects would have been ideal (Hennink & Kaiser, 2022). Recruitment of subjects proved extremely difficult, as only a few responses were received despite contact with around 20 institutions. The specific target group presented an additional hurdle. Another limitation is the unclear definition and differentiation of disabilities. It turned out that different definitions of cognitive or learning disabilities are used. Often, a cognitive disability was diagnosed in childhood without any differentiation being made in later years. It was, therefore, challenging to identify subjects with an apparent learning disability.

People with cognitive impairments rarely use laptops and are mainly active with their smartphones, as phone calls with supervisors during the recruitment process revealed. Furthermore, the study was initially designed to test online shops. It turned out that this was irrelevant for many participants. These unexpected circumstances led to the study being modified. The compromise was that the participants should be able to use a laptop, while the websites were adapted to the needs of the target group to reflect their reality better.

5. Conclusion

In today's society, access to the Internet has become fundamental for education, employment, and social relationships (Schuppener et al., 2019). Yet, even with established accessibility standards and legal requirements, many barriers remain online – especially for individuals with cognitive impairments (WebAIM, 2024). Much of the existing accessibility research has been conducted with participants with disabilities other than cognitive impairments, which limits the extent to which current findings address the needs of all users (e.g., Cinquin et al., 2019; Henni et al., 2022; Hortizuela, 2022; Mack et al., 2021). The aim of this research was thus to address this research gap and explore real-world experiences of users with cognitive impairments on the Internet and compare these experiences with normative guidelines of digital accessibility.

We conducted qualitative, semi-structured interviews with 12 individuals diagnosed with learning disabilities. The participants were presented with three websites related to leisure activities, yielding different degrees of digital accessibility (high-level, mid-level, and low-level accessibility; Inclusive Design Research Centre, n.d.; WebAIM, 2025). Participants were asked to test the websites by completing a specific task (e.g., gathering information about ticket prices) and were then interviewed about their user experience with the websites. Thereby, we focused on three aspects of digital accessibility: a) easy-to-read language, b) consistent navigation, and c) pause, stop, and hide.

Our results revealed several noteworthy findings, contributing to the understanding of how individuals with cognitive impairments use and experience the Internet. First, we find that digital services and the Internet are essential for individuals with cognitive impairments, specifically for communication, information search, and entertainment. Participants also reported primarily using mobile devices (i.e., smartphones and tablets) rather than laptops. Second, our results show that easy-to-read language significantly improves user-friendliness, as easy-to-read language helps individuals with cognitive impairments to understand the website texts more easily. However, we also find that the wish for easy-to-read language differs within the target group depending on the individual's cognitive abilities. Third, consistent and clear navigation significantly contributes to user-friendliness by supporting orientation on the website, as does clear labelling of website content by the means of clear categories. Multiple navigation paths, as proposed by the WCAG (W3C, 2024), however, did not enhance user-friendliness and instead led to confusion, suggesting that digital accessibility guidelines may need to be revised to reflect user needs of individuals with cognitive impairments. Fourth, contrary to previous studies (Chadwick et al., 2013; Marx & Bremer, 2024), we do not find that moving contents undermine perceptions of user-friendliness of individuals with learning disabilities; for example, slideshows were generally not found to be distracting. Finally, our results do not support the assumption that websites with higher levels of digital accessibility necessarily improve user-friendliness (Blazeska-Tabakovska et al., n.d.; WebAIM, 2008). In fact, the low-level accessibility website was ranked highest for overall user-friendliness by our target group, while the website that should theoretically offer the highest accessibility received top ratings from only two participants, indicating that additional aspects of digital accessibility, not examined in our research, may strongly influence perceptions of user-friendliness. easy-to-read language

The main limitations of this research relate to the sample size and participant recruitment. Due to one participant withdrawing during the interview and one needing substantial assistance due to nervousness, two interviews had to be excluded from the analysis, reducing the number of cases. Additionally, participants were recruited from institutions, but many institutions were unresponsive to our inquiry to conduct interviews as part of this study, limiting the pool of

participants. Finally, the varying use of the terms learning disability and cognitive ability led to some uncertainty in the final classification of the participants' diagnoses.

The findings of our research have implications for both future research and policymakers. For future research, it would be useful to examine in more detail how different subgroups within the spectrum of cognitive impairments perceive and interact with digital interfaces, as their needs can vary widely within a group (Droutsas et al., 2025; Small et al., 2005). In addition, given how many participants in our study mainly used smartphones, mobile-first digital accessibility appears to deserve particular attention. For individuals with visual impairments (e.g., Alajarmeh, 2022; Schmutz et al., 2017) or individuals with limited attentional resources (Carlbring, 2020), for example, studies have explored how WCAGs can help to improve user-friendliness on mobile devices. In a similar vein, future research could specifically explore how individuals with learning abilities may benefit from WCAGs designed to improve user-friendliness on smartphones. Finally, as immersive technologies such as augmented and virtual reality will become more relevant for digital participation, future studies should also examine how WCAG principles can be adapted to these environments to ensure accessibility for individuals with cognitive impairments (Creed et al., 2023). On the policy side, our results point to the importance of integrating user perspectives of groups with varying cognitive disabilities into accessibility standards—especially with regard to easy-to-read language and navigation design. As the needs of individuals with cognitive impairments are still underprioritized when it comes to policy implementation regarding digital accessibility (Gartland et al., 2022; Mason et al., 2022), clearer guidelines should be considered. These could include the mandatory implementation of specific features such as plain or simplified language to reduce barriers and support full participation in the digital world. Through this, the topic of digital accessibility can receive more attention, more intensive discussions can be conducted and as a result, the digital inclusion of all users can be promoted.

6. Bibliography

- Alajarmeh, N. (2022). The extent of mobile accessibility coverage in WCAG 2.1: sufficiency of success criteria and appropriateness of relevant conformance levels pertaining to accessibility problems encountered by users who are visually impaired. *Universal Access in the Information Society*, 21(2), 507-532. <https://doi.org/10.1007/s10209-020-00785-w>.
- Ågren, K. A., Kjellberg, A., & Hemmingsson, H. (2020). Digital participation? Internet use among adolescents with and without intellectual disabilities: A comparative study. *New Media & Society*, 22(12), 2128–2145. <https://doi.org/10.1177/1461444819888398>.
- Berger, A., Caspers, T., Croll, J., Hofmann, J., Kubicek, H., Peter, U., Ruth-Janneck, D., & Trump, T. (2010). Web 2.0/barrierefrei. *Aktion Mensch*. https://medien.aktion-mensch.de/publikationen/barrierefrei/Studie_Web_2.0.pdf.
- BIK BITV-Test. (n.d.-a). 2.2.2 Bewegte Inhalte abschaltbar | BIK BITV-Test Ergebnisse und Methodik. <https://bitvtest.de/pruefschritt/bitv-20-web/bitv-20-web-9-2-2-2-bewegte-inhalte-abschaltbar>.
- BIK BITV-Test. (n.d.-b). 3.2.3 Konsistente Navigation | BIK BITV-Test Ergebnisse und Methodik. <https://bitvtest.de/pruefschritt/bitv-20-web/bitv-20-web-9-3-2-3-konsistente-navigation>.

- Blazeska-Tabakovska, N., Ristevski, B., Savoska, S., & Jolevski, I. (2019). Web Content Accessibility for People with Cognitive Disabilities. IX International Conference on Applied Internet and Information Technologies AIIT, Zrenjanin. <https://eprints.uklo.edu.mk/id/eprint/2337>.
- Botelho, F. H. F. (2021). Accessibility to digital technology: Virtual barriers, real opportunities. *Assistive Technology*, 33(S1), 27–34. <https://doi.org/10.1080/10400435.2021.1945705>.
- Braddock, D., Hoehl, J., Tanis, S., Ablowitz, E., & Haffer, L. (2013). The Rights of People With Cognitive Disabilities to Technology and Information Access. *Inclusion*, 1(2), 95–102. <https://doi.org/10.1352/2326-6988-01.02.95>.
- Bundesministerium des Innern und für Heimat. (2024a). Die Leichte Sprache. https://www.barrierefreiheit-dienstekonsolidierung.bund.de/Webs/PB/DE/barrierefreie_it/uebergreifende-anforderungen-web-und-app/leichte-sprache/leichte-sprache-node.html.
- Bundesministerium des Innern und für Heimat. (2024b). Web Content Accessibility Guidelines 2.1 (WCAG 2.1). <https://www.barrierefreiheit-dienstekonsolidierung.bund.de/Webs/PB/DE/gesetze-und-richtlinien/wcag/wcag-node.html>.
- Bundesministerium des Innern und für Heimat. (2024c). WCAG 2.2: Geplante Änderungen in neuer Version. https://www.barrierefreiheit-dienstekonsolidierung.bund.de/Webs/PB/DE/gesetze-und-richtlinien/wcag/wcag_2_2/wcag-2-2-node.html.
- Bundesministerium des Innern und für Heimat. (2024d). Digitale Barrierefreiheit. https://www.barrierefreiheit-dienstekonsolidierung.bund.de/Webs/PB/DE/barrierefreie_it/digitale-barrierefreiheit/digitale-barrierefreiheit-node.html.
- Carlbring, J. (2020). Inclusive Design for Mobile Devices with WCAG and Attentional Resources in Mind: An investigation of the sufficiency of the Web Content Accessibility Guidelines when designing inclusively and the effects of limited attentional resources. <https://www.diva-portal.org/smash/get/diva2:1441358/FULLTEXT01.pdf>.
- Chadwick, D., Wesson, C., & Fullwood, C. (2013). Internet Access by People with Intellectual Disabilities: Inequalities and Opportunities. *Future Internet*, 5(3), 376–397. <https://doi.org/10.3390/fi5030376>.
- Cinquin, P. A., Guitton, P., & Sauzéon, H. (2019). Online e-learning and cognitive disabilities: A systematic review. *Computers & Education*, 130, 152–167. <https://doi.org/10.1016/j.compedu.2018.12.004>.
- Cleveland Clinic. (2023). Intellectual Disability. https://my.clevelandclinic.org/health/diseases/25015-intellectual-disability-id?utm_source=chatgpt.com
- Conway, V., & Mace, A. (2019). Digital Accessibility: Perceptions, Expectations and Reality. Australasian Conference on Information Systems, Perth. https://aisel.aisnet.org/acis2019/43?utm_source=aisel.aisnet.org%2Facis2019%2F43&utm_medium.
- Dirks, S., Bühler, C., Edler, C., Miesenberger, K., & Heumader, P. (2020). Cognitive Disabilities and Accessibility - Pushing the Boundaries of Inclusion Using Digital Technologies and Accessible eLearning Environments. In K. Miesenberger, R. Manduchi, M. Covarrubias Rodriguez & P. Peñáz (Eds.), 17th International Conference. *Computers Helping People with Special Needs* (pp. 47-52). Lecco: Springer International Publishing. https://doi.org/10.1007/978-3-030-58805-2_6.

- Droutsas, N., Spyridonis, F., Daylamani-Zad, D., & Ghinea, G. (2025). Web accessibility barriers and their cross-disability impact in eSystems: A scoping review. *Computer Standards & Interfaces*, 92, 103923. <https://doi.org/10.1016/j.csi.2024.103923>.
- European Commission. (n.d.). European accessibility act. https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/disability/union-equality-strategy-rights-persons-disabilities-2021-2030/european-accessibility-act_en#:~:text=The%20European%20accessibility%20act%20is%20a%20directive%20that,barriers%20created%20by%20divergent%20rules%20in%20Member%20States.
- European Commission. (2021). EN 301549:2021. Accessibility requirements for ICT products and services. https://accessible-eu-centre.ec.europa.eu/content-corner/digital-library/en-3015492021-accessibility-requirements-ict-products-and-services_en.
- European Union. (n.d.) Richtlinie (EU) 2016/2102 des Europäischen Parlaments und des Rates vom 26. Oktober 2016 über den barrierefreien Zugang zu den Websites und mobilen Anwendungen öffentlicher Stellen. <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX:32016L2102>.
- Gartland, S., Flynn, P., Carneiro, M. A., Holloway, G., Fialho, J. d. S., Cullen, J., Hamilton, E., Harris, A., & Cullen, C. (2022). The State of Web Accessibility for People with Cognitive Disabilities: A Rapid Evidence Assessment. *Behavioral Sciences*, 12(2), 1–25. <https://doi.org/10.3390/bs12020026>.
- Gehirngerecht Digital GmbH. (n.d.). Impressum. <https://gehirngerecht.digital/impressum/>
- Glencross, S., Mason, J., Katsikitis, M., & Greenwood, K. (2021). Internet Use by People with Intellectual Disability: Exploring Digital Inequality - A Systematic Review. *Cyberpsychology, behavior and social networking*, 24(8), 503–520. <https://doi.org/10.1089/cyber.2020.0499>.
- Girke, D. (n.d.). BITV-Consult. <https://bitvconsult.de/impressum.php>
- Hammill, D. D., Leigh, J. E., McNutt, G., & Larsen, S. C. (1988). A New Definition of Learning Disabilities. *Journal of Learning Disabilities*, 4(4), 336–342. <https://doi.org/10.2307/1510735>.
- Heister, N., Zentel, P., & Koebe, S. (2023). Participation in Everyday Leisure and Its Influencing Factors for People with Intellectual Disabilities: A Scoping Review of the Empirical Findings. *Disabilities*, 3(2), 269–294. <https://doi.org/10.3390/disabilities3020018>.
- Hellbusch, J. E., & Probiech, K. (2011). Barrierefreiheit verstehen und umsetzen: Webstandards für ein zugängliches und nutzbares Internet. dpunkt.verlag.
- Henni, S. H., Maurud, S., Fuglerud, K. S., & Moen, A. (2022). The experiences, needs and barriers of people with impairments related to usability and accessibility of digital health solutions, levels of involvement in the design process and strategies for participatory and universal design: a scoping review. *BMC public health*, 22(1), 1–18. <https://doi.org/10.1186/s12889-021-12393-1>
- Hennink, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine*, 292, 114523. <https://doi.org/10.1016/j.socscimed.2021.114523>.

- Hortizuela, R. D. (2022). Towards Web Equality: Efforts on Web Accessibility for Persons with Cognitive Disability. *International Journal of Research in Science & Engineering*, 2(03), 1–16. <https://doi.org/10.55529/ijrise.231.16>.
- Inclusive Design Research Centre. (n.d.). AChecker: Accessibility checker. <https://achecks.org/achecker>
- ISO – International Organization for Standardization. (2023). ISO 24495-1:2023. Plain Language. Part 1: Governing principles and guidelines. <https://www.iso.org/standard/78907.html>.
- Kuckartz, U., & Rädiker, S. (2022). *Qualitative Inhaltsanalyse. Methoden, Praxis, Computerunterstützung*. Verlagsgruppe Beltz.
- Mack, K., McDonnell, E., Jain, D., Lu Wang, L., E. Froehlich, J., & Findlater, L. (2021). What do we mean by “accessibility research”? A literature survey of accessibility papers in CHI and ASSETS from 1994 to 2019. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*, 371, 1–18. <https://doi.org/10.1145/3411764.3445412>.
- Marx, C., & Bremer, R. (2024). Zweiter Testbericht: So barrierefrei sind Online-Shops in Deutschland. *Aktion Mensch*. <https://delivery-aktion-mensch.stylelabs.cloud/api/public/content/aktion-mensch-testbericht-barrierefreiheit-webshops-2024?v=3f968466>
- Mason, A. M., Compton, J., & Bhati, S. (2021). Disabilities and the digital divide: assessing web accessibility, readability, and mobility of popular health websites. *Journal of Health Communication*, 26(10), 667–674. <https://doi.org/10.1080/10810730.2021.1987591>.
- MSKTC.org. (2014). Writing and Testing Plain Language. <https://msktc.org/sites/default/files/2023-05/MSKTC-PlainLanguageTool-508.pdf>.
- Poulourtzidis, I., Marina Katsouli, A., Anastasiades, S., Makroglou, S., Sidiropoulos, E., & Bamidis, P. D. (2022). Supporting Digital Inclusion and Web Accessibility for People with Cognitive Disabilities. In B. Séroussi, P. Weber, F. Dhombres, C. Grouin, J-D. Liebe, S. Pelayo, A. Pinna, B. Rance, L. Sacchi, A. Ugon, A. Benis & P. Gallos (Eds.), *Challenges of Trustable AI and Added-Value on Health* (pp. 619-623). Paris: IOS Press Ebooks. <https://doi.org/10.3233/SHTI220543>.
- Sallafranque-St-Louis, F., & Normand, C. L. (2017). From solitude to solicitation: How people with intellectual disability or autism spectrum disorder use the internet. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 11(1), article 7. <https://doi.org/10.5817/CP2017-1-7>.
- Schmutz, S., Sonderegger, A., & Sauer, J. (2017). Implementing recommendations from web accessibility guidelines: a comparative study of nondisabled users and users with visual impairments. *Human factors*, 59(6), 956–972. <https://doi.org/10.1177/0018720817708397>
- Seeman, L., & Lewis, C. (2019). Cognitive and Learning Disabilities. In Y. Yesilada & S. Harper (Eds.), *Web Accessibility: A Foundation for Research* (pp.49–58). London: Springer-Verlag. https://link.springer.com/chapter/10.1007/978-1-4471-7440-0_28.
- Shapiro, R. J., & Rohde, G. L. (2000). Falling through the Net: Toward Digital Inclusion. <https://www.ntia.gov/sites/default/files/data/fttn00/contents00.html>.
- Siegel, L. S. (1989). IQ Is Irrelevant to the Definition of Learning Disabilities. *Journal of Learning Disabilities*, 22(8), 469–478. <https://doi.org/10.1177/002221948902200803>.

- Siegel, L. S. (1999). Issues in the Definition and Diagnosis of Learning Disabilities: A Perspective on Guckenberger v. Boston University. *Journal of Learning Disabilities*, 32(4), 304–319. <https://doi.org/10.1177/002221949903200405>.
- Small, J., Schallau, P., Brown, K., & Appleyard, R. (2005). Web accessibility for people with cognitive disabilities. In G. van der Veer & C. Gale (Eds.), *CHI '05 Extended Abstracts on Human Factors in Computing Systems*, 1793–1796. New York. <https://doi.org/10.1145/1056808.1057024>.
- Szabó, P., Ara, J., Halmosi, B., Sik-Lányi, C., & Guzsvinecz, T. (2023). Technologies Designed to Assist Individuals with Cognitive Impairments. *Sustainability*, 15(18), 13490. <https://doi.org/10.3390/su151813490>.
- Turner, C. (2023). The use of the internet for sexual and intimate purposes by individuals with intellectual disabilities: A systematic review and thematic analysis. *FPID Bulletin: The Bulletin of the Faculty for People with Intellectual Disabilities*, 21(1), 36–36. <https://doi.org/10.53841/bpsfpid.2023.21.1.36>.
- VERBI Software. (2025). MAXQDA 2024 (Version 24) [Computer Software]. <https://www.maxqda.com/de/download>.
- Vollenwyder, B., Schneider, A., Krueger, E., Brühlmann, F., Opwis, K., & Mekler, E.D. (2018). How to Use Plain and Easy-to-Read Language for a Positive User Experience on Websites. In: Miesenberger, K., Kouroupetroglou, G. (Eds.), *Computers Helping People with Special Needs*. 16th International Conference on Computers Helping People with Special Needs. Linz: Springer. https://doi.org/10.1007/978-3-319-94277-3_80.
- Vouglanis, T., & Drigas, A. (2022). The positive impact of Internet on the cognitive, psychological and social side of people's personality with disabilities. *Technium Social Sciences Journal*, 35, 29–42. <https://doi.org/10.47577/tssj.v35i1.7269>.
- W3C. (2024). Web Content Accessibility Guidelines (WCAG) 2.1. <https://www.w3.org/TR/WCAG21>.
- WebAIM. (2008). We Still Know Too Little, and We Do Even Less. https://webaim.org/articles/cognitive/cognitive_too_little.
- WebAIM. (2024). WebAIM: The WebAIM Million—The 2024 report on the accessibility of the top 1,000,000 home pages. <https://webaim.org/projects/million>.
- WebAIM. (2025). WAVE Web Accessibility Evaluation Tools. <https://wave.webaim.org>.
- Youngsun, L., Wehmeyer, M. L., Palmer, S. B., Williams-Diehm, K., Davies, D. K., & Stock, S. E. (2010). The Effect of Student-Directed Transition Planning With a Computer-Based Reading Support Program on the Self-Determination of Students With Disabilities. *The Journal of Special Education*, 45(2), 104–117. <https://doi.org/10.1177/0022466909358916>.

Appendix A: Category system

Table 1: Interview introduction

Main category	Subcategory	Explanation (if needed)
Interest in the internet	-	
Frequency of internet use	-	
Medium of internet use	-	Captures the preferred devices or technologies for internet access
Purpose and intention of internet use	-	Areas of application of the Internet
Positive aspects of the internet	-	
Negative aspects of the internet	-	
Support in using the internet	-	

Table 2: High-level accessibility website

Main category	Subcategories	Explanation (if needed)
Awareness of the website	-	Possible previous experience with this website
(First) orientation on the website	Page in plain language Default setting of the website Font size Images	Noticing the assistance, testing the page with plain language
Search for ticket prices	Use of difficult language Navigation and orientation Use of plain language	Comprehensibility, no switch to the website with plain language Find their way around the website Comprehensibility, switch to the page with plain language
Search for animal information	Use of difficult language Navigation and orientation Use of plain language	Comprehensibility, no switch to the website with plain language Find their way around the website Comprehensibility, switch to the page with plain language
Suggestions for improvement	-	Suggestions that users have for improving the website.

Table 3: Mid-level accessibility website

Main category	Subcategories	Explanation (if needed)
Awareness of the website	-	Possible previous experience with this website
(First) orientation on the website	Slideshow	Perception of the slideshow, irritation, distraction
Search for ticket prices	Use of difficult language	Comprehensibility, no switch to the website with plain language
	Navigation and orientation	Find their way around the website
	Use of plain language	Comprehensibility, switch to the page with plain language
Suggestions for improvement	-	Suggestions that users have for improving the website.
Accessible mode		Perception , Readability

Table 4: Low-level accessibility website

Main category	Subcategories	Explanation (if needed)
Awareness of the website	-	Possible previous experience with this website
(First) orientation on the website	Slideshow	Perception of the slideshow, irritation, distraction
Search for ticket prices	Language used	Comprehensibility of the language used
	Navigation and orientation	Find their way around the website
Suggestions for improvement	-	Suggestions that users have for improving the website.

How to cite this article

Volkman A., Eller E., Hennighausen C. (2025). The impact of digital accessibility on the user experience of people with cognitive impairments. Journal of Accessibility and Design for All, 15(2), 50-73. <https://doi.org/10.17411/jacces.v15i2.612>.



© Journal of Accessibility and Design for All (JACCES), ISSN 2013-7087, is published by the [Universitat Politècnica de Catalunya, Barcelona Tech](#), with the sponsoring of [ONCE Foundation for Cooperation and Social Inclusion of People with Disabilities](#). This issue is free of charge and is available in electronic format.



This work is licensed under an Attribution-Non-Commercial 4.0 International Creative Commons License. Readers are allowed to read, download, copy, redistribute, print, search, or link to the full texts of the articles or use them for any other lawful purpose, giving appropriate credit. It must not be used for commercial purposes. To see the complete license contents, please visit <http://creativecommons.org/licenses/by-nc/4.0/>.



JACCES is committed to providing accessible publication to all, regardless of technology or ability. The present document grants vital accessibility since it applies to [WCAG 2.2](#) and [PDF/UA](#) recommendations. The evaluation tool used has been Adobe Acrobat® Accessibility Checker. If you encounter problems accessing the content of this document, you can contact us at jacces@cat.ac.upc.edu

