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Accessible Authentication Mechanisms in Web and Mobile Systems for People with Disabilities: A Systematic Literature Review

Mecanismos de autenticación accesibles en sistemas web y móviles para personas con discapacidad: una revisión sistemática de la literatura

Mecanismos de autenticação acessíveis em sistemas web e móveis para pessoas com deficiência: uma revisão sistemática da literatura

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Abstract

In the digital age, authentication is essential for accessing the web and mobile platforms, yet many mechanisms still overlook the accessibility challenges faced by people with disabilities. In this work, a systematic literature review was conducted, considering studies published between 2014 and the first quarter of 2025. To this effect, the Kitchenham guidelines were followed. An automated search strategy was implemented to identify relevant studies addressing authentication mechanisms, accessibility, and disability. The data extraction process was systematically guided by six research questions. The findings were synthesized through a narrative approach in order to facilitate their organization and interpretation. A total of 50 studies was selected, addressing diverse authentication methods, accessibility considerations, disability types, and system contexts (web and mobile). The literature shows a predominant focus on visual impairments and usability aspects, while other types of disability remain underrepresented. Passwords and PINs continue to be the most widely used mechanisms, although there is a growing adoption of biometric alternatives. The limitations are mainly related to user capabilities, system design, and process complexity. These results highlight the need to design and evaluate more inclusive authentication solutions, ensuring accessibility validation with representative user groups.

Keywords: authentication, accessible authentication, accessibility, disability, web systems, mobile applications, assistive technology

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Resumen

En la era digital, la autenticación es esencial para acceder a la web y a las plataformas móviles. Sin embargo, muchos mecanismos aún pasan por alto los desafíos de accesibilidad que enfrentan las personas con discapacidad. En este trabajo se realizó una revisión sistemática de la literatura, considerando estudios publicados entre 2014 y el primer trimestre de 2025. Para ello, se siguieron las directrices de Kitchenham. Se implementó una estrategia de búsqueda automatizada para identificar estudios relevantes que abordan mecanismos de autenticación, accesibilidad y discapacidad. El proceso de extracción de datos fue guiado de manera sistemática por seis preguntas de investigación. Los hallazgos se sintetizaron mediante un enfoque narrativo para facilitar su organización e interpretación. Se seleccionó un total de 50 estudios, que abordan diversos métodos de autenticación, consideraciones de accesibilidad, tipos de discapacidad y contextos de sistema (web y móvil). La literatura muestra un enfoque predominante en las discapacidades visuales y en aspectos de usabilidad, mientras que otros tipos de discapacidad permanecen subrepresentados. Las contraseñas y los PIN continúan siendo los mecanismos más utilizados, aunque se observa una adopción creciente de alternativas biométricas. Las limitaciones se relacionan principalmente con las capacidades de los usuarios, el diseño del sistema y la complejidad de los procesos. Estos resultados ponen de relieve la necesidad de diseñar y evaluar soluciones de autenticación más inclusivas, garantizando la validación de la accesibilidad con grupos de usuarios representativos.

Palabras clave: autenticación, autenticación accesible, accesibilidad, discapacidad, sistemas web, aplicaciones móviles, tecnología de asistencia

Resumo

Na era digital, a autenticação é essencial para acessar a web e as plataformas móveis. No entanto, muitos mecanismos ainda negligenciam os desafios de acessibilidade enfrentados por pessoas com deficiência. Neste trabalho realizou-se uma revisão sistemática da literatura, considerando estudos publicados entre 2014 e o primeiro trimestre de 2025. Para isso, seguiram-se as diretrizes de Kitchenham. Implementou-se uma estratégia de busca automatizada para identificar estudos relevantes que abordam mecanismos de autenticação, acessibilidade e deficiência. O processo de extração de dados foi sistematicamente orientado por seis questões de pesquisa. Os achados foram sintetizados por meio de uma abordagem narrativa, a fim de facilitar sua organização e interpretação. Um total de 50 estudos foi selecionado, abordando diversos métodos de autenticação, considerações de acessibilidade, tipos de deficiência e contextos de sistema (web e móvel). A literatura mostra um foco predominante em deficiências visuais e em aspectos de usabilidade, enquanto outros tipos de deficiência permanecem sub-representados. Senhas e PINs continuam sendo os mecanismos mais utilizados, embora haja uma adoção crescente de alternativas biométricas. As limitações estão principalmente relacionadas às capacidades dos usuários, ao desenho do sistema e à complexidade dos processos. Esses resultados evidenciam a necessidade de projetar e avaliar soluções de autenticação mais inclusivas, garantindo a validação da acessibilidade com grupos de usuários representativos.

Palavras-chaves: autenticação, autenticação acessível, acessibilidade, deficiência, sistemas web, aplicações móveis, tecnologia assistiva

INTRODUCTION

Authentication mechanisms play a critical role in ensuring security and privacy on digital platforms, especially in areas such as healthcare, e-banking, and government services (Rashid *et al.*, 2021). As these services become increasingly integrated into daily life, their accessibility for people with disabilities remains a significant concern. According to national data, in Mexico, more than 11 million people aged 15 and older live with some form of disability (INEGI, 2020). Likewise, the World Health Organization reported that, in 2021, an estimated 1.3 billion people, representing 16% of the global population, were living with a disability (World Health Organization & World Bank, 2022), highlighting the importance of inclusive design. Although prior research has addressed usability and accessibility in web and mobile systems, few studies specifically focus on how authentication mechanisms support users with different types of disabilities (Andrew *et al.*, 2020). This gap may result in ineffective access, usability issues, or even security vulnerabilities.

This paper presents a systematic literature review (SLR) on accessible authentication mechanisms in web and mobile systems. Our objective is to identify their characteristics, limitations, and key accessibility and security-related factors. For software engineering, these insights are particularly valuable, as they provide practitioners with evidence-based guidance on how to design authentication mechanisms that balance usability, accessibility, and security. By integrating such practices into the development lifecycle, engineers can not only enhance compliance with accessibility standards but also improve the overall quality and inclusiveness of software systems, making them more robust and user centered.

RELATED WORK

Research on accessibility and authentication shows that most efforts have concentrated on visual impairments, with limited attention to other disabilities. For blind or low-vision users, reliance on screen readers and magnifiers introduces vulnerabilities such as shoulder surfing or auditory eavesdropping (Andrew *et al.*, 2020). Biometric methods, particularly fingerprint authentication, have been highlighted as more secure and accessible alternatives. For people with hearing impairments, authentication systems based on audio instructions create barriers, while, for those with cognitive disabilities, complex passwords are particularly challenging. Studies suggest that mnemonic or image-based schemes, as well as strategies that reduce memory load, can improve usability. Users with motor impairments also face difficulties with touch-based systems, although gesture-based and voice recognition approaches have shown promise (Andrew *et al.*, 2020). Additional findings reveal that many mobile users rely on personal information for passwords, which compromises security. While fingerprint recognition stands out as inclusive, methods such as iris or retina scans remain inaccessible for blind users (Faustino & Girouard, 2018).

Finally, recent work (Furnell *et al.*, 2022) explores accessible authentication within the three-factor paradigm, stressing the need to design mechanisms inclusively from the outset. Persistent challenges include the scarcity of usability evaluations, the limited representativeness of the study samples, and the need to address diverse user requirements.

METHODOLOGY

The methodology followed for this SLR was based on the guidelines proposed in (Kitchenham *et al.*, 2015), which define three main stages: planning, conducting, and reporting. During the conducting stage, a search strategy based on the quasi-gold standard approach (Zhang *et al.*, 2011) was applied, along with the

snowballing procedures described in Wohlin (2014). The reporting stage employed a narrative synthesis to organize and present the findings, as recommended in Popay *et al.* (2006).

Planning

Research questions. To conduct this study, five research questions (RQs) were defined. These questions served as a guide to extract key aspects regarding the most used authentication methods for people with disabilities**.**

RQ1: *What is the most addressed type of disability when implementing accessible authentication mechanisms in web and mobile systems?*
RQ2: *How does the literature evaluate the accessibility of authentication mechanisms?*
RQ2.1: *What are the characteristics of the population with disabilities used to validate accessible authentication mechanisms?*
RQ3: *What are the limitations of implementing the accessible authentication mechanisms identified in the literature?*
RQ4: *Which accessible authentication mechanisms are reported in the literature for each type of system (web or mobile)?*
RQ5: *Which domains are most frequently addressed when implementing accessible authentication mechanisms?*

Search process

The search strategy followed the manual process proposed by Zhang *et al.* (2011). The initial exploration was conducted in the ACM Digital Library, IEEE Xplore, and ScienceDirect, focusing on studies addressing authentication mechanisms (*e.g.*, passwords, 2FA, biometrics), accessibility barriers for people with disabilities (visual, auditory, motor, or cognitive), and inclusive design or assistive technologies. From this manual search, several relevant studies were obtained from each data source:

ACM Digital Library: 11 studies
IEEE Xplore: 14 studies
ScienceDirect: six studies

To improve retrieval performance, a customized search string was created for each database, enabling the exploration of different information retrieval strategies. During the manual search, we identified that articles retrieved through certain terms such as *blockchain*, *machine learning*, *Arduino*, or *VR* (virtual reality) were outside the scope of this study. Therefore, these terms were excluded via the NOT operator, in order to ensure that the retrieved papers remained within the research domain, focused on accessible and user-centered authentication mechanisms. The search strings are presented below:

ACM Digital Library: *"authentication" AND "accessibility" AND ("disability" OR "impairments" OR "blind" OR "low vision" OR "deaf" OR "hard of hearing" OR "partially sighted") AND ("web" OR "mobile") AND NOT ("cloud computing" OR "machine learning" OR "blockchain" OR "arduino" OR "esp32" OR "VR")*
Recall: 81.82%; *Effort:* 5.59%.

IEEE Xplore: *"auth*" AND "accessib*" AND ("disab*" OR "impairments" OR "blind" OR "low vision" OR "deaf" OR "hard of hearing" OR "partially sighted" OR "visually impaired" OR "older adults") AND NOT ("game" OR "ai" OR "blockchain" OR "framework")*

Recall: 85.71%; *Effort:* 9.45%.

ScienceDirect: Given the high volume of results and limited filtering options, custom scripts were used to automate reference extraction, convert records to a spreadsheet, and filter out irrelevant articles. After this process, the adjusted search string applied was *authentication AND ("impaired" OR "Impairment" OR "disabled" OR "disability" OR "elderly" OR "captcha") AND ("accessibility" OR "usability")*

Recall: 100%; *Effort:* 0.22%.

In the Taylor & Francis Online, Wiley Online Library, and SpringerLink data sources, fewer than five relevant studies were retrieved, in comparison with those identified through the manual search used to build the quasi-gold standard (Zhang *et al.*, 2011).

Conducting

The identification and selection of relevant articles followed the methodology proposed by Kitchenham *et al.* (2015). Four phases were defined, each with specific inclusion and exclusion criteria.

- **Phase 1.** The inclusion criteria required studies to be published in English between 2014 and the first quarter of 2025, while the exclusion criteria filtered out only abstracts, technical reports, presentation slides, or book chapters.
- **Phase 2.** The exclusion criteria removed studies without full-text access and secondary studies such as review articles.
- **Phase 3.** As established in the inclusion criteria, the title and abstract suggested that the study addressed at least one research question. The exclusion criteria also eliminated duplicate studies.
- **Phase 4.** The inclusion criteria required that the study explicitly addressed at least one research question.

Reporting

Based on the inclusion and exclusion criteria described in the previous section, the following results were obtained: IEEE Xplore provided 11 studies, the ACM Digital Library 16, Taylor & Francis one, Wiley Online Library one, ScienceDirect seven, and SpringerLink three, resulting in a total of 39 studies. Subsequently, the snowballing method (Wohlin, 2014) was applied with one backward iteration to each of the databases, yielding 11 additional studies.

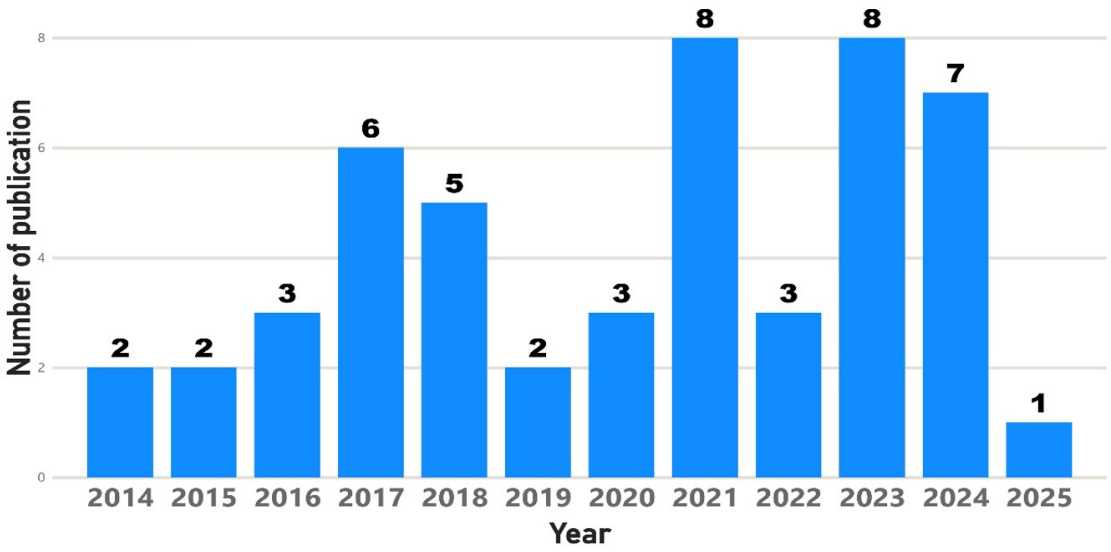
As a result of the search strategy and the selection process, a total of 50 relevant studies were identified. The narrative synthesis was developed following the methodology proposed by Popay *et al.* (2006). The 50 relevant studies can be found in Appendix A.

The ACM Digital Library was the source that provided the most studies, accounting for 38% (19 studies), followed by IEEE Xplore with 32% (16 studies) and ScienceDirect with 14% (seven studies). SpringerLink accounted for 8% (four studies). Finally, PLOS ONE, Science Publication, Taylor & Francis, and Wiley Online Library each provided one study.

In addition, we grouped the documents according to the year of publication, as shown in Figure 1. The analysis revealed that the majority of the primary studies selected were published in 2021 and 2023, each with eight studies, followed by 2024 with seven. The Figure presents the count of primary studies by year.

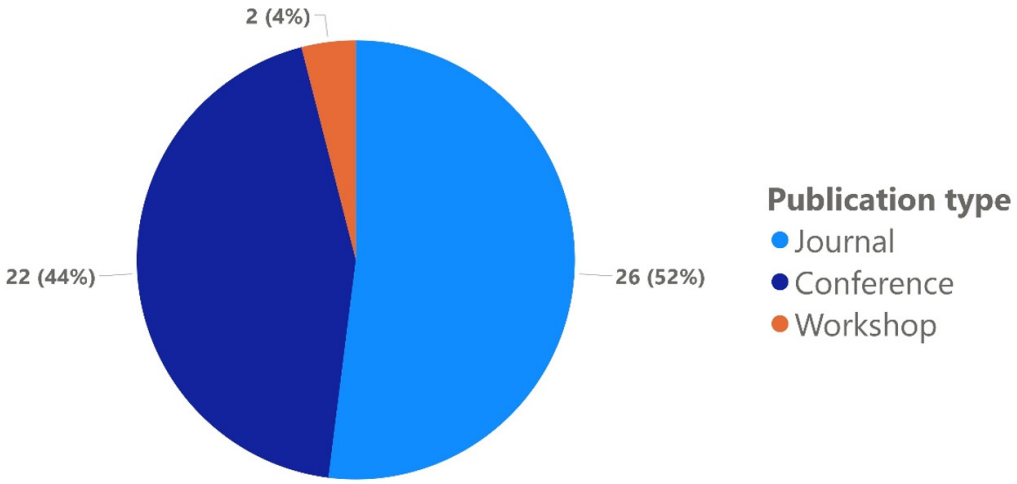
The years with the fewest publications were 2014, 2015, and 2016. Since this systematic literature review was limited to the first quarter of 2025, only one study from that year was available.

Figure 1. *Number of studies per year*



Furthermore, we classified the articles according to publication type, as illustrated in Figure 2. The distribution shows that 26 studies were published in journals, 22 in conference proceedings, and only two in workshop publications.

Figure 2. *Number of studies by publication type*



RESULTS

RQ1. Consistent with previous studies (Andrew *et al.*, 2023), visual impairments are the most frequently addressed disability in the literature on accessible authentication mechanisms. Our systematic analysis confirms this trend, highlighting that most research primarily focuses on users with visual challenges, often examining the barriers they face and the adaptations required for effective authentication.

Figure 3. *Number of studies by type of disability*

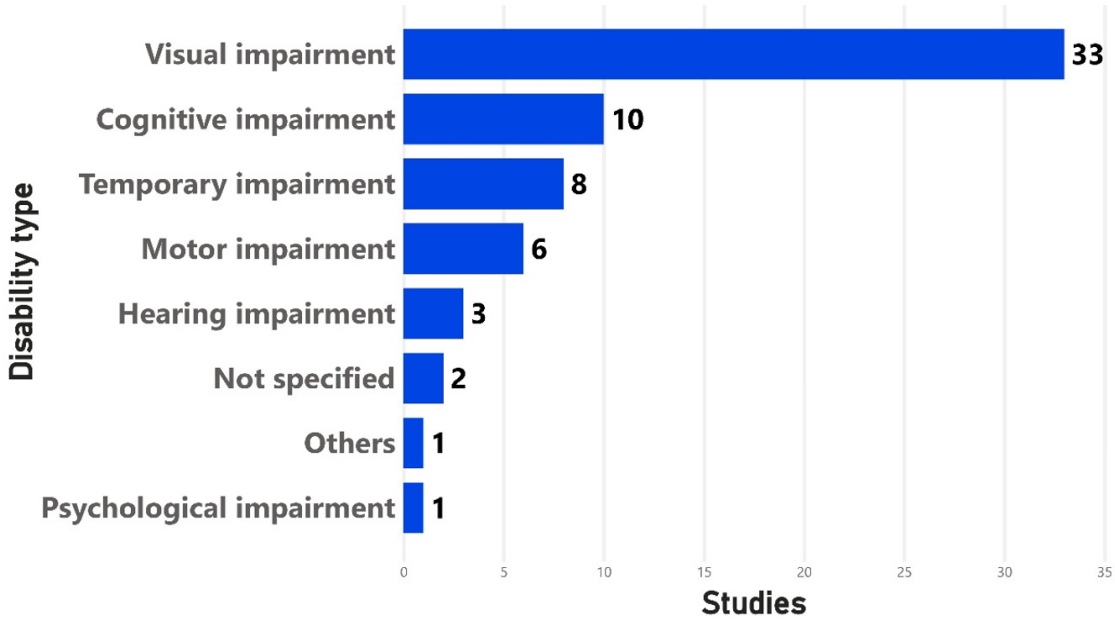
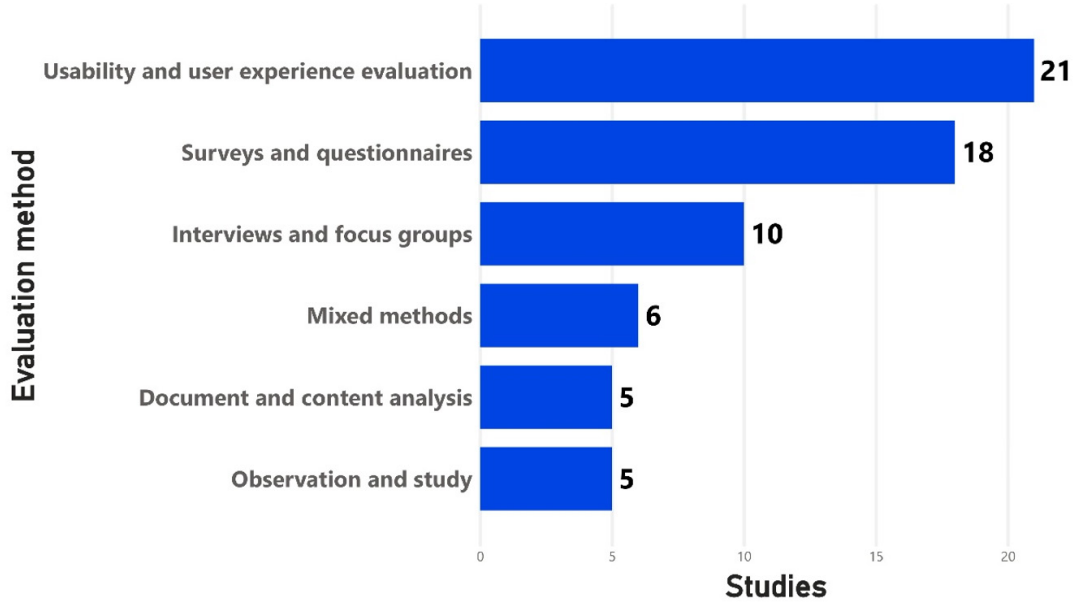


Figure 3 shows the number of studies by type of disability. Visual impairment is the most relevant disability, as it is addressed in 33 studies. Although visual impairments dominate the literature, a subset of studies simultaneously consider multiple types of disability, most commonly combining visual and motor impairments. These broader investigations provide a more comprehensive understanding of accessibility challenges, emphasizing the need to design authentication mechanisms that accommodate diverse user needs beyond the most studied disability.

RQ2. Several methodologies are reported in the literature, as shown in Figure 4. Following Patton (2014), the studies employed approaches to evaluate the accessibility of authentication mechanisms, such as interviews, focus groups, observation, surveys, document analysis, usability evaluations, and mixed methods. Usability and user experience assessments are the most common, highlighting a focus on testing mechanisms in real-world or simulated contexts and measuring practical effectiveness.

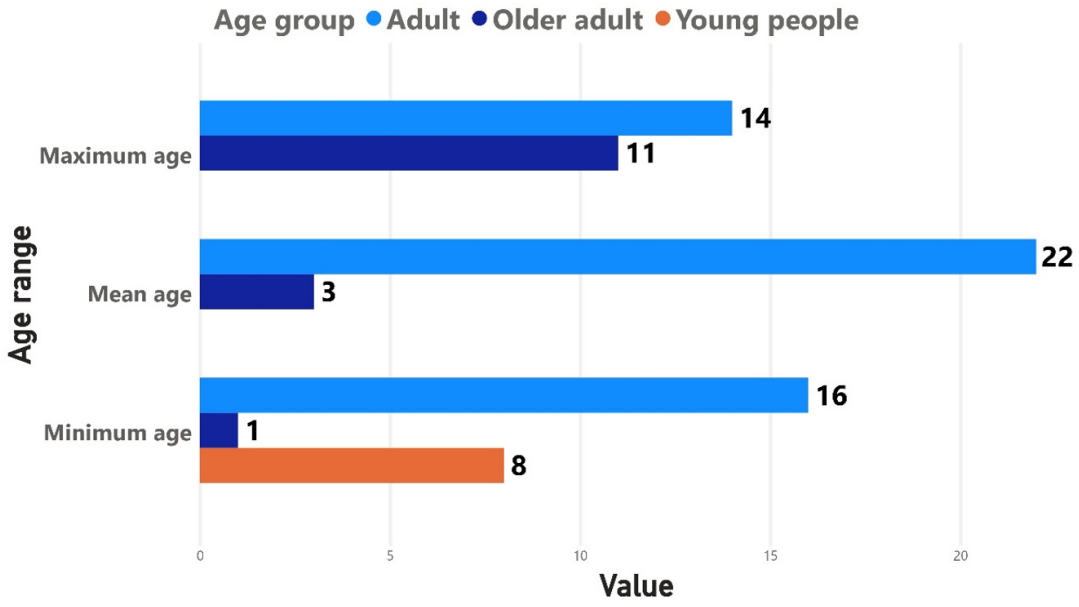
Although less frequent, document and content analyses provide valuable insights by involving expert users, such as developers or accessibility specialists, in order to identify potential improvements. In practice, usability studies are often combined with complementary methods—surveys, interviews, or focus groups—, allowing researchers to capture both objective performance metrics and users' needs, expectations, and emotional barriers, resulting in a more comprehensive evaluation.

Figure 4. *Number of studies by type of accessibility evaluation*



RQ2.1. Several studies do not fully report their participants' demographic information, such as total number and the minimum, maximum, and mean age. As shown in Figure 5, the available data indicate that all participants are adults over 18 years old, suggesting that accessible authentication mechanisms have not been evaluated with children or adolescents. Most studies rely on small samples, typically 50 participants or fewer, which may limit the representativeness of the results and the generalization of findings to a broader population.

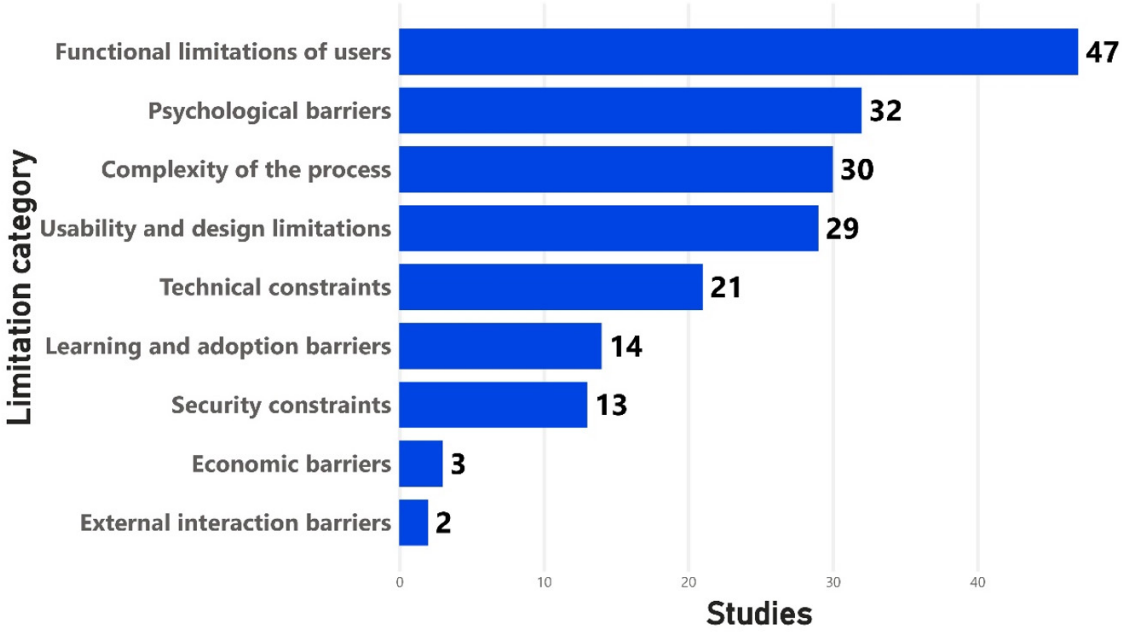
Figure 5. *Age distribution of participants across the analyzed studies*



The age distribution shows a clear concentration of participants in middle adulthood (30-60 years), followed by older adults, reflecting the target contexts of the evaluated systems, which are often financial services, government processes, or workplace applications. Larger samples in some studies provide more insight into patterns according to age and type of disability, but, overall, the evidence highlights a strong focus on adult users and the need to include younger populations in future evaluations.

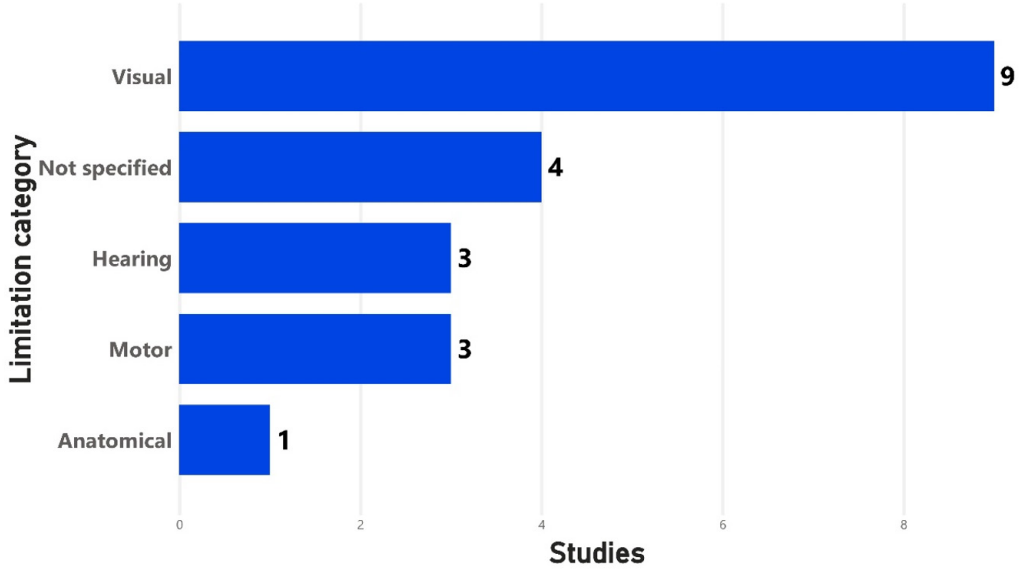
RQ3. From the analysis of the selected studies, we identified several limitations affecting the implementation of accessible authentication mechanisms in web and mobile systems. These limitations were thematically categorized into nine groups to better illustrate the main barriers reported across the literature.

Figure 6. *Thematic barriers by category in the implementation of accessible authentication mechanisms.*



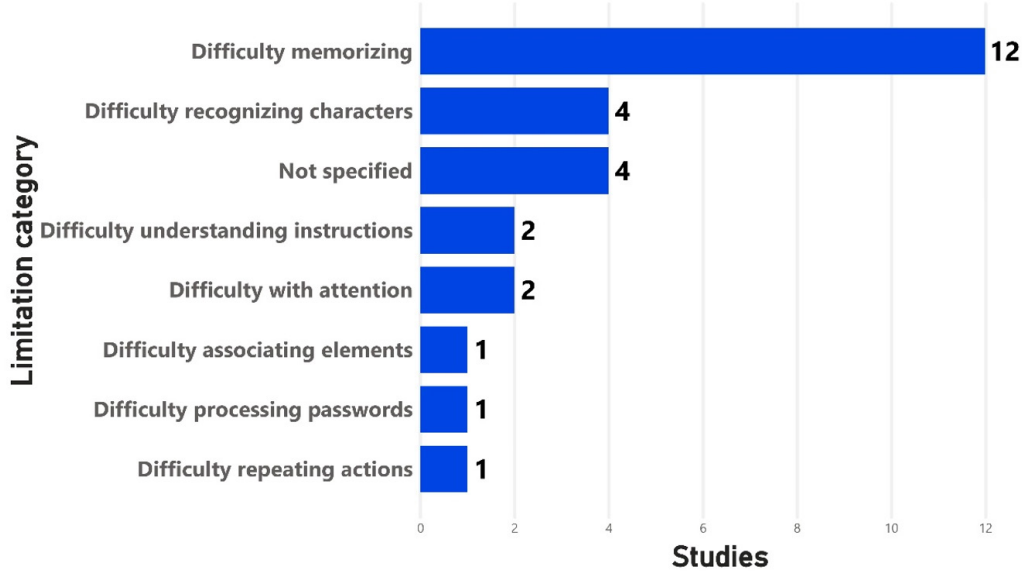
It should be noted that the graphical data presented do not represent the number of studies addressing each limitation, but rather the total number of limitations mentioned—a single study may describe multiple limitations across different thematic categories.

Figure 7. *Number of functional limitations of users reported in the literature on accessible authentication mechanisms*



The most frequent category corresponds to barriers related to users' functional abilities (Figure 7). These refer to difficulties associated with visual, auditory, motor, or cognitive impairments that can hinder interaction with authentication systems. Visual impairments were the most frequently mentioned, followed by auditory and motor limitations and, to a lesser extent, anatomical alterations affecting ocular function rather than visual acuity or mobility.

Figure 8. *Number of cognitive barriers reported in the literature on accessible authentication mechanisms*



The cognitive barriers shown in Figure 8 were also prominent, particularly those linked to memory load and information processing. In some cases, these difficulties may not reflect a cognitive impairment *per se*, but rather the high cognitive demand required by certain authentication processes such as remembering complex passwords or multi-step sequences.

Figure 9. *Number of psychological barriers reported in the literature on accessible authentication mechanisms*

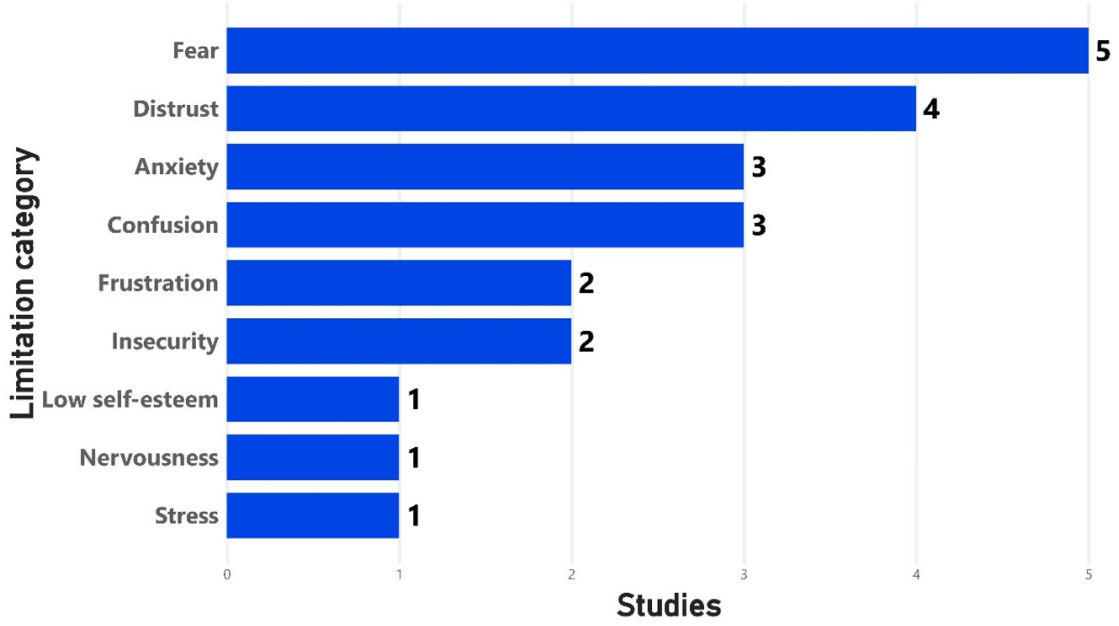
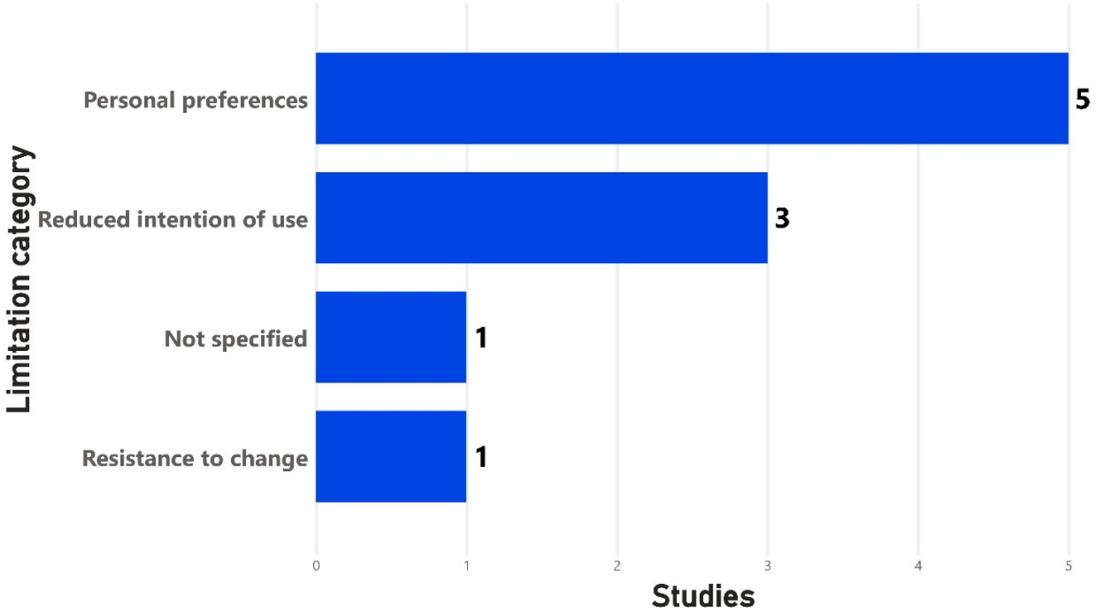


Figure 10. *Number of emotional barriers reported in the literature on accessible authentication mechanisms*



The psychological and emotional factors shown in Figures 9 and 10 constituted another major category, encompassing emotional states such as the fear, frustration, anxiety, or insecurity experienced when using authentication mechanisms. Following the International Classification of Functioning, Disability, and Health (ICF), these limitations relate to the emotional and motivational dimensions of user interaction, which may influence confidence, satisfaction, or the willingness to engage with specific authentication systems.

Figure 11. *Number of barriers related to process complexity in the literature on accessible authentication mechanisms*

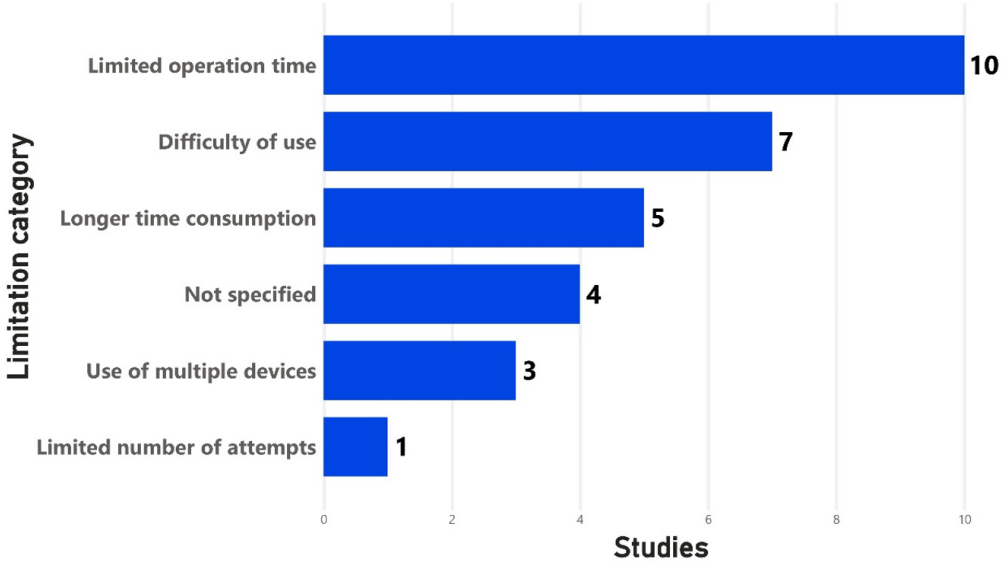
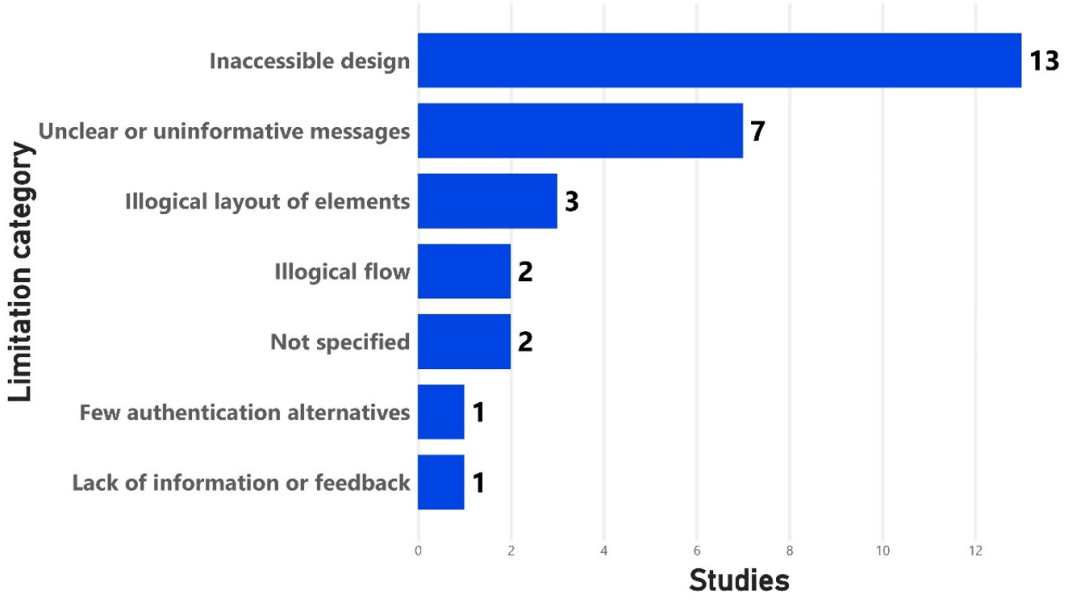
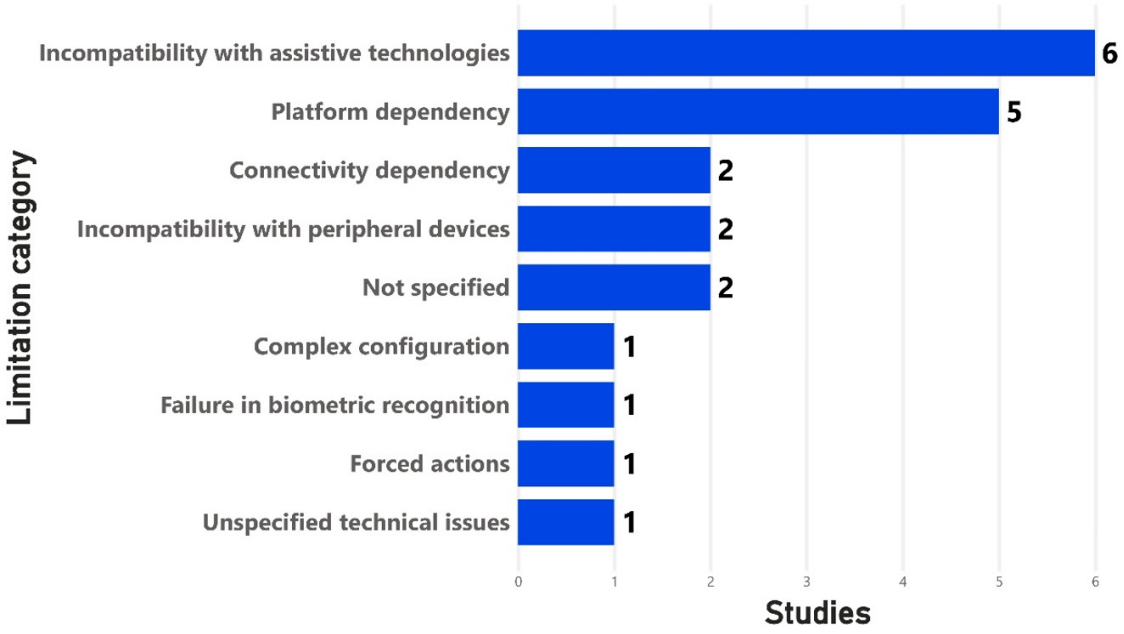


Figure 12. *Number of usability and design limitations reported in the literature on accessible authentication mechanisms*



Process complexity, usability, and design issues also appeared recurrently in the reviewed literature (Figures 11 and 12). The reported barriers included poorly structured interfaces, confusing workflows, unclear messages, and processes requiring multiple steps or devices. Such characteristics can increase the interaction effort and reduce the overall accessibility of authentication mechanisms.

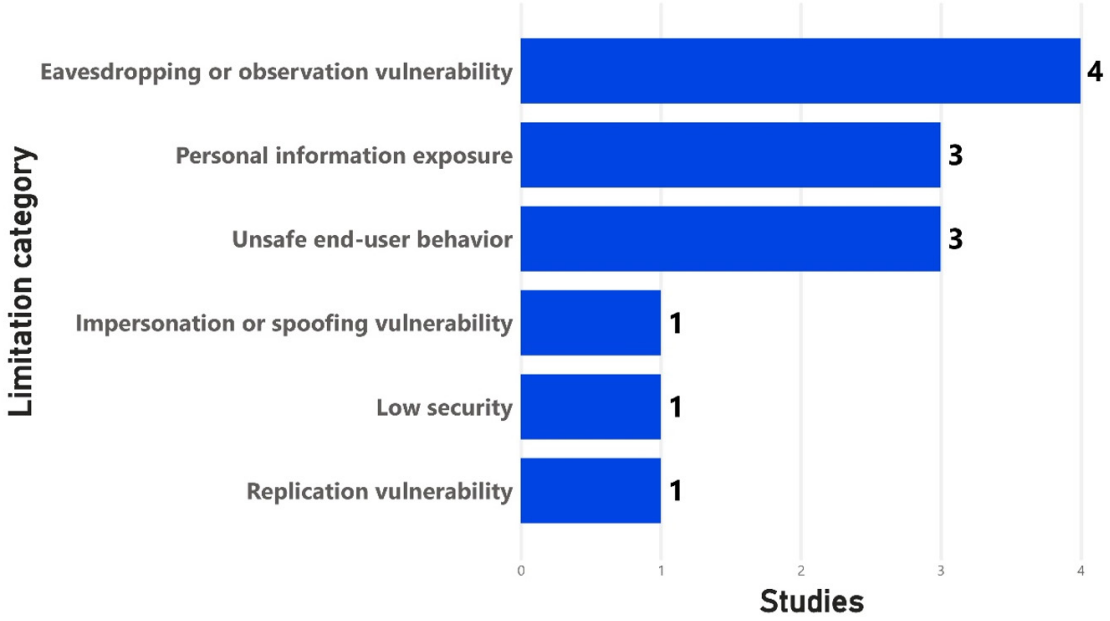
Figure 13. Number of technical constraints reported in the literature on accessible authentication mechanisms



As shown in Figure 13, technical barriers were also identified, such as incompatibility with assistive technologies, dependence on specific platforms or connectivity, and failures in biometric recognition. These issues highlight the need for interoperability and adaptive design to ensure accessibility across diverse devices and assistive environments.

Learning and adoption challenges were mentioned in studies emphasizing the necessity of prior experience or technical knowledge from users (n=9), as well as steep learning curves in mastering certain authentication methods (n=5).

Figure 14. *Number of security barriers reported in the literature on accessible authentication mechanisms*



Finally, regarding security limitations, Figure 14 highlights that eavesdropping or observation vulnerabilities are the most frequently cited barrier in the literature. This is followed by concerns regarding personal information exposure and unsafe end-user behavior. In contrast, specific technical flaws such as impersonation, low security, and replication vulnerabilities appear to be less prominent in current studies.

RQ4. The reviewed systems were classified into two groups: web and mobile (Figure 15). Mobile systems are more prevalent, reflecting the widespread availability of sensors (cameras, fingerprint scanners, voice recognition) and touch interfaces that facilitate adaptation for various disabilities. Users' familiarity with personal devices also makes mobile solutions more convenient and accessible. The classification follows Grassi *et al.* (2017), which outlines the three-factor authentication framework ('something you know', 'something you have', and 'something you are'). One study also incorporates a behavior-based factor, analyzing usage patterns and gestures to support continuous authentication.

While most systems still rely on 'something you know' (passwords, PINs), there is a clear trend towards combining this with 'something you are' (biometrics). The inclusion of behavioral factors in even a single study reflects emerging interest in continuous and adaptive authentication mechanisms, highlighting the evolving strategies aimed at improving both security and accessibility for diverse user populations.

RQ5. To address this question, the primary studies were classified according to the most frequently reported application domains. Banking and payment systems dominate the literature (Figure 16), likely because online banking and ATM authentication pose significant barriers for users with disabilities. This has motivated researchers to design solutions that often combine biometrics with multi-factor authentication in order to enhance both accessibility and security.

In contrast, general domains are underrepresented, with very few studies addressing them. This gap suggests that users with disabilities may encounter challenges when accessing authentication mechanisms in sectors where security requirements are less regulated, highlighting the need for broader research beyond highly regulated environments.

Figure 15. *Distribution of reviewed systems by platform type (left) and authentication factor (right)*

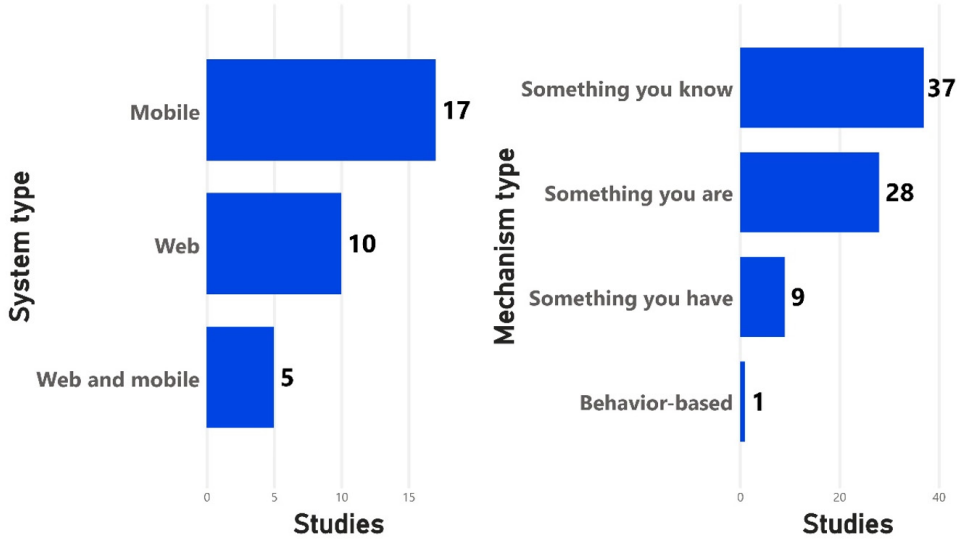
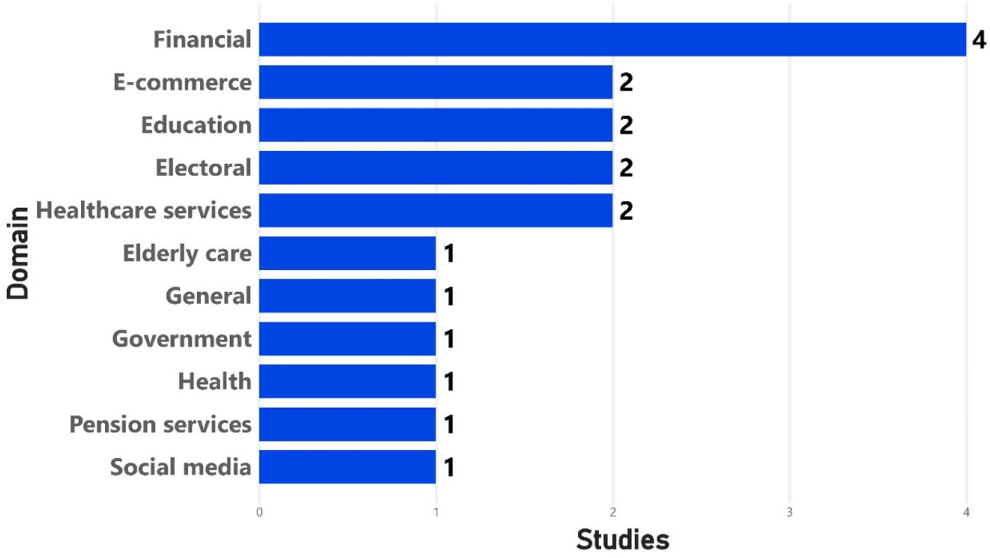


Figure 16. *Distribution of studies by application domain*



DISCUSSION

Despite advances in the development of accessible authentication mechanisms, significant gaps and challenges remain. The literature is heavily concentrated on visual impairments, with considerably less attention given to auditory, cognitive, motor, or psychological disabilities. Usability and user experience evaluations are the most common methods for assessing these mechanisms, often complemented by surveys and interviews, thus enabling researchers to capture both interaction performance and users' perceptions. However, several limitations persist due to user functional capacities as well as design and usability issues, which frequently stem from a lack of inclusive design rather than technological constraints.

Mobile solutions dominate the research landscape, likely due to the availability of biometric authentication and users' familiarity with personal devices. While these approaches improve accessibility in mobile contexts, there is a need for further investigation in web-based systems and underexplored domains. Additionally, participant samples predominantly include adults, leaving out children and adolescents, who may have distinct accessibility needs, underscoring the importance of expanding population diversity in future studies.

Threats to validity

Several threats to validity were identified in this review. Construct validity may be affected by variations in the definition of key concepts and disability types across studies, as well as differences in outcome measures, which can compromise comparability. To mitigate this, the International Classification of Functioning, Disability, and Health (ICF, 2001) was adopted, and search strategies were calibrated based on observed terminology trends. Internal validity could be threatened by potential interpretation biases, which were addressed through independent data extraction by two reviewers.

External validity is limited by small or non-representative samples, with participants predominantly being adults. Children and adolescents are largely excluded, highlighting a gap in population diversity and underscoring the urgent need for future studies to include younger populations. Additionally, older studies may not reflect current authentication technologies. Therefore, this review focused on studies published between 2014 and early 2025.

CONCLUSIONS

Visual impairments are the most frequently addressed type of disability, while cognitive, auditory, and psychological disabilities require greater attention due to their unique challenges regarding secure authentication. Accessibility evaluations primarily rely on usability testing, although mixed methods incorporating user perspectives are recommended. The main limitations relate to users' functional capacities, inadequate system design, and the complexity of authentication processes. Passwords and PINs ('something you know') remain the most studied mechanisms, but there is a growing trend towards biometrics and behavior-based authentication, highlighting the potential for more secure and inclusive solutions.

Financial systems dominate the research focus, whereas other domains such as government, mental health, and inclusive workplace platforms remain underexplored. Overall, these findings emphasize the need to design more inclusive authentication mechanisms, broaden participant populations in future studies, and develop robust methods to evaluate accessibility in digital authentication systems.

Future research should also focus on children and adolescents, who are largely underrepresented in current studies. As demonstrated in Csibi *et al.* (2021), these groups tend to be highly dependent on mobile devices, a factor that should be considered when designing authentication systems for young users with disabilities, allowing them to participate without feeling excluded.

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AUTHORS' CONTRIBUTIONS

César González-López: Investigation, Writing – Original Draft, Data Curation, Software, Visualization, Writing – Review & Editing.
Pablo Hernán De La Cruz-Moreno: Investigation, Writing – Original Draft, Data Curation, Software, Visualization, Writing – Review & Editing.
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Declaration of the Use of Artificial Intelligence

All content of the manuscript was reviewed by the authors. No Artificial Intelligence tools were used for the original manuscript content, data analysis, results, or conclusions.

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Appendix A

Primary studies

Primary study	APA Reference	Source
PS1	Erinola, A., Buckmann, A., Friedauer, J., Yardim, A., & Sasse, M. A. (2023). *"As usual, I needed assistance of a seeing person": Experiences and challenges of people with disabilities and authentication methods* [Conference article]. 8th IEEE European Symposium on Security and Privacy Workshops. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10190634	IEEE Explore
PS2	Dosono, B., Hayes, J., & Wang, Y. (2018). Toward accessible authentication: Learning from people with visual impairments. *IEEE Internet Computing, 22*(2), 62-70. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8259407	IEEE Explore
PS3	Whittington, P., Dogan, H., Phalp, K., & Phillips, J. (2022). *Health ability pass: An accessible healthcare gateway for patients with disabilities* [Conference article]. 2022 IEEE International Conference on e-Business Engineering, ICEBE 2022. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10035091	IEEE Explore
PS4	Mageshwari, S., & Kuppusamy, K. S. (2016). *Multimodal authentication approach for visually impaired in smartphone platforms* [Conference article]. Proceedings of the 10th International Conference on Intelligent Systems and Control, ISCO 2016. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7727064	IEEE Explore
PS5	Whittington, P., & Dogan, H. (2023). Authentibility Pass: *An accessible authentication gateway for people with reduced abilities* [Conference article]. Proceedings - 2023 IEEE International Conference on e-Business Engineering, ICEBE 2023. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10356162	IEEE Explore
PS6	Balaji, V., & Kuppusamy, K. S. (2017). *Towards accessible mobile pattern authentication for persons with visual impairments* [Conference article]. ICCIDS 2017 - International Conference on Computational Intelligence in Data Science. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8272662	IEEE Explore
PS7	Kowtko, M. A. (2014). *Biometric authentication for older adults* [Conference article]. 2014 IEEE Long Island Systems, Applications and Technology Conference, LISAT 2014. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6845213	IEEE Explore
PS8	Ophoff, J., & Renaud, K. V. (2023). *Universal design for website authentication: Views and experiences of senior citizens* [Conference article]. 38th IEEE/ACM International Conference on Automated Software Engineering Workshops, ASEW 2023. https://doi.org/10.1109/ASEW60602.2023.00011	IEEE Explore
PS9	Bhowmik, B., Sudhama, K. K., Dongala, J. R., Antony, R. T., & Girish, K. K. (2024). *Enhancing financial accessibility: A tailored UPI payment application for Divyangjan* [Conference article]. 10th International Conference on Advanced Computing and Communication Systems, ICACCS 2024. https://doi.org/10.1109/ICACCS60874.2024.10717117	IEEE Explore

PS10	Caporusso, N. (2021). An improved PIN input method for the visually impaired [Conference article]. 44th International Convention on Information, Communication and Electronic Technology, MIPRO 2021. https://doi.org/10.23919/MIPRO52101.2021.9597153	IEEE Explore
PS11	Selker, T., & Pelletier, J. (2023). Secure, accessible, virtual voting infrastructure (SAVVI): Reducing barriers for disabled and overseas voters [Conference article]. 2023 46th ICT and Electronics Convention, MIPRO 2023. https://doi.org/10.23919/MIPRO57284.2023.10159972	IEEE Explore
PS12	Moreno, L., Petrie, H., & Schmeelk, S. (2023). *Accessibility barriers with authentication methods for blind and partially sighted people in the Spanish speaking world.* https://doi.org/10.14236/ewic/BCSHCI2023.22	ACM Digital Library
PS13	Andrew, S., Watson, S. L., Oh, T., & Tigwell, G. W. (2023). *Authentication challenges in customer service settings experienced by deaf and hard of hearing people* [Conference article]. Conference on Human Factors in Computing Systems. https://doi.org/10.1145/3544549.3585707	ACM Digital Library
PS14	Bhole, P. V., Li, Z., Bokolia, S., Oh, T., Tigwell, G. W., & Peiris, R. L. (2024). Haptic2FA: Haptics-based accessible two-factor authentication for blind and low vision people. *Proceedings of the ACM on Human-Computer Interaction, 8*(MHCI), 268. https://doi.org/10.1145/3676509	ACM Digital Library
PS15	Kamarushi, M. V., Watson, S. L., Tigwell, G. W., & Peiris, R. L. (2022). OneButtonPIN: A single button authentication method for blind and low vision users to improve accessibility and prevent eavesdropping. *Proceedings of the ACM on Human-Computer Interaction, 6*(MHCI), 212. https://doi.org/10.1145/3546747	ACM Digital Library
PS16	Faustino, D. B., & Girouard, A. (2018). *Understanding authentication method use on mobile devices by people with vision impairment* [Conference article]. 20th International ACM SIGACCESS Conference on Computers and Accessibility. https://doi.org/10.1145/3234695.3236342	ACM Digital Library
PS17	Clarke, J. M., Mehrnezhad, M., & Toreini, E. (2024). Invisible, unreadable, and inaudible cookie notices: An evaluation of cookie notices for users with visual impairments. *ACM Transactions on Accessible Computing, 17*(1), 1. https://doi.org/10.1145/3641281	ACM Digital Library
PS18	Wolf, F., Kuber, R., & Aviv, A. J. (2017). *Perceptions of mobile device authentication mechanisms by individuals who are blind* [Conference article]. 19th International ACM SIGACCESS Conference on Computers and Accessibility. https://doi.org/10.1145/3132525.3134793	ACM Digital Library
PS19	Ophoff, J., Johnson, G., & Renaud, K. (2021). *Cognitive function vs accessible authentication: Insights from dyslexia research* [Conference article]. 18th International Web for All Conference, W4A 2021. https://doi.org/10.1145/3430263.3452427	ACM Digital Library

PS20	Jain, M., Diwakar, N., & Swaminathan, M. (2021). *Smartphone usage by expert blind users* [Conference article]. Conference on Human Factors in Computing Systems. https://doi.org/10.1145/3411764.3445074	ACM Digital Library
PS21	Barbosa, N. M., Hayes, J., & Wang, Y. (2016). *UniPass: Design and evaluation of a smart device-based password manager for visually impaired users*. http://dx.doi.org/10.1145/2971648.2971722	ACM Digital Library
PS22	Hayes, J., Li, X., & Wang, Y. (2017). *"I always have to think about it first": Authentication experiences of people with cognitive impairments*. https://doi.org/10.1145/3132525.3134788	ACM Digital Library
PS23	Petrie, H., & Wakefield, M. (2020). *Remote moderated and unmoderated evaluation by users with visual disabilities of an online registration and authentication system for health services* [Conference article]. 9th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion (DSAI 2020). https://doi.org/10.1145/3439231.3439248	ACM Digital Library
PS24	Forget, A., Chiasson, S., & Biddle, R. (2015). *Choose your own authentication* [Conference article]. NSPW '15, Twente, Netherlands. http://dx.doi.org/10.1145/2841113.2841114	ACM Digital Library
PS25	Jin, X., & Fan, M. (2022). *"I used to carry a wallet, now I just need to carry my phone": Understanding current banking practices and challenges among older adults in China* [Conference article]. ASSETS '22, Athens, Greece. https://doi.org/10.1145/3517428.3544820	ACM Digital Library
PS26	Lewis, B., & Venkatasubramanian, K. (2021). *"I ... got my nose-print. but it wasn't accurate": How people with upper extremity impairment authenticate on their personal computing devices* [Conference article]. CHI Conference on Human Factors in Computing Systems (CHI '21), Yokohama, Japan. https://doi.org/10.1145/3411764.3445070	ACM Digital Library
PS27	Ali, A. (2015). *Sequential gestural passcodes on Google Glass* [Conference article]. ASSETS '15: The 17th International ACM SIGACCESS Conference on Computers and Accessibility, Lisbon, Portugal. https://doi.org/10.1145/2700648.2811326	ACM Digital Library
PS28	Kumalasari, R. A. D., Rahardjo, K., Kusumawati, A., & Sunarti, S. (2024). Biometric-based self-service technology adoption by older adult: Empirical evidence from pension fund sector in Indonesia. *Cogent Business & Management, 11*(1), 2325543. https://doi.org/10.1080/23311975.2024.2325543	Taylor & Francis
PS29	Balayogi, G., & Kuppusamy, K. S. (2023). ARJUNA: An accessible pin entry model in smartphones for persons with low vision. *Internet Technology Letters, 6*(5), e466. https://doi.org/10.1002/itl2.466	Wiley Online Library
PS30	Algarni, F. (2024). A lightweight and secure authentication protocol for visually impaired and handicapped people in the telehealth system. *Alexandria Engineering Journal, 106*, 793-808. https://doi.org/10.1016/j.aej.2024.08.078	ScienceDirect

PS31	Zimmermann, V., & Gerber, N. (2020). The password is dead, long live the password – A laboratory study on user perceptions of authentication schemes. *International Journal of Human-Computer Studies, 133*, 26-44. https://doi.org/10.1016/j.ijhcs.2019.08.006	ScienceDirect
PS32	Chithra, P. L., & Sathya, K. (2021). Scanning-to-speech challenge-response authentication test for visually impaired. *Computers and Electrical Engineering, 93*, 107133. https://doi.org/10.1016/j.compeleceng.2021.107133	ScienceDirect
PS33	Elordi, U., Bertelsen, A., Unzueta, L., Aranjuelo, N., Goenetxea, J., & Arganda Carreras, I. (2021). Optimal deployment of face recognition solutions in a heterogeneous IoT platform for secure elderly care applications. *Procedia Computer Science, 192*, 514-523. https://doi.org/10.1016/j.procs.2021.09.093	ScienceDirect
PS34	Ho, Y. L., Lau, S. H., & Azman, A. (2021). Comparison of BlindLoginV2 and AudioBlindLogin with the common textual password authentication for the blind and visually impaired using smartphones. *International Journal of Human Computer Studies, 155*, 102718. https://doi.org/10.1016/j.ijhcs.2021.102718	ScienceDirect
PS35	Alkhomsan, M. N., Alturayeif, N., Alwadei, S., & Baslyman, M. (2022). Usage guidelines: Toward usable Saudi M-Government applications for elderly users. *Journal of King Saud University - Computer and Information Sciences, 35*(1), 101684. https://doi.org/10.1016/j.jksuci.2022.11.011	ScienceDirect
PS36	Frasca, M., & La Torre, D. (2024). An extended Daugman's algorithm for iris with eye pathology recognition. *Expert Systems With Applications, 254*, 124160. https://doi.org/10.1016/j.eswa.2024.124160	ScienceDirect
PS37	Alayed, A. (2024). Are Saudi Arabian banks' mobile applications accessible for blind or partially sighted users? A customers' perspective and evaluation. *Universal Access in the Information Society, 24*, 585-606. https://doi.org/10.1007/s10209-023-01082-y	SpringerLink
PS38	Di Campi, A. M., & Luccio, F. L. (2025). Accessible authentication methods for persons with diverse cognitive abilities. *Universal Access in the Information Society, 24*, 2195-2217. https://doi.org/10.1007/s10209-025-01189-4	SpringerLink
PS39	Laamanen, M., Ladonlahti, T., Uotinen, S., Okada, A., Bañeres, D., & Koçdar, S. (2021). Acceptability of the e-authentication in higher education studies: Views of students with special educational needs and disabilities. *International Journal of Educational Technology in Higher Education, 18*, 4. https://doi.org/10.1186/s41239-020-00236-9	SpringerLink
PS40	Jain, M., Tripathi, R., Bhansali, I., & Kumar, P. (2019). *Automatic generation and evaluation of usable and secure audio recaptcha* [Conference article]. ASSETS 2019 – 21st International ACM SIGACCESS Conference on Computers and Accessibility. https://doi.org/10.1145/3308561.3353777	ACM Digital Library

PS41	Saulynas, S., & Kuber, R. (2017). *Towards brain-computer interface (BCI) and gestural-based authentication for individuals who are blind* [Conference article]. 19th International ACM SIGACCESS Conference on Computers and Accessibility. https://doi.org/10.1145/3132525.3134785	ACM Digital Library
PS42	Oliveira, R., Silva, T., De Abreu, J. F., & Almeida, M. (2016). Automatic identification in accessible iTV services: Proposal of an IPTV interface. ACM International Conference Proceeding Series, 384–391. https://doi.org/10.1145/3019943.3019998;WGROUP:STRING:ACM	ACM Digital Library
PS43	Hogges, J., Shahriar, H., Sneha, S., & Ahamed, S. (2020). *A two-step password authentication system for Alzheimer patients* [Conference article]. 2020 IEEE 44th Annual Computers, Software, and Applications Conference, COMPSAC 2020. https://doi.org/10.1109/COMPSAC48688.2020.00-52	IEEE Explore
PS44	Farid, F., & Ahamed, F. (2019). *Biometric authentication for dementia patients with recurrent neural network* [Conference article]. 2019 International Conference on Electrical Engineering Research & Practice (ICEERP). https://doi.org/10.1109/ICEERP49088.2019.8956981	IEEE Explore
PS45	Ahmed, E., DeLuca, B., Hirowski, E., Magee, C., Tang, I., & Coppola, J. F. (2017). *Biometrics: Password replacement for elderly?* [Conference article]. 2017 IEEE Long Island Systems, Applications and Technology Conference (LISAT). https://doi.org/10.1109/LISAT.2017.8001958	IEEE Explore
PS46	Banerjee, A., & Hasan, M. (2018, July 10-12). *Tap based user authentication on smartphones for visually impaired people* [Conference article]. 2018 9th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Bengaluru, India. https://doi.org/10.1109/ICCCNT.2018.8494056	IEEE Explore
PS47	Yamaguchi, M., Nakata, T., Watanabe, H., Okamoto, T., & Kikuchi, H. (2014, October 5-8). *Vulnerability of the conventional accessible CAPTCHA used by the White House and an alternative approach for visually impaired people* [Conference article]. 2014 IEEE International Conference on Systems, Man, and Cybernetics (SMC), San Diego, CA, USA. https://doi.org/10.1109/SMC.2014.6974548	IEEE Explore
PS48	Blanco-Gonzalo, R., Lunerti, C., Sánchez-Reillo, R., & Guest, R. M. (2018). Biometrics: Accessibility challenge or opportunity? *PLoS ONE, 13*(3), e0194111. https://doi.org/10.1371/journal.pone.0194111	PLOS ONE
PS49	Ho, Y. L., Bendrissou, B., Azman, A., & Lau, S. H. (2017). BlindLogin: A graphical authentication system with support for blind and visually impaired users on smartphones. *American Journal of Applied Sciences, 14*(5), 551–559. https://doi.org/10.3844/ajassp.2017.551.559	Science Publication
PS50	Kuppusamy, K. S., & Aghila, G. (2018). HuMan: An accessible, polymorphic and personalized CAPTCHA interface with preemption feature tailored for persons with visual impairments. *Universal Access in the Information Society, 17*(4), 841-864. https://doi.org/10.1007/s10209-017-0567-3	SpringerLink