A Review of 25 Years of Human-Computer Interaction Research on Reading Support Technologies for People with Disabilities Published in the ACM Digital Library

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Abstract

Reading is a vital skill for social, educational, and professional development, yet various disabilities can impact a person's ability to read and develop literacy skills. HCI and accessibility researchers have explored a wide range of technologies to support reading for people with disabilities. To understand trends in this space, we analyzed 101 publications from Association for Computing Machinery (ACM) venues (2000–2024), coding for target user communities, research methods, technologies, types of support, and contributions. Most research focused on people with dyslexia, followed by people who are Blind or Low Vision, Deaf or Hard of Hearing, or who have intellectual and cognitive disabilities. The majority of studies involved artifact development and short-term lab-based evaluations, with common technologies including visual augmentations, text modifications, and simplification—primarily aimed at improving readability, comprehension, and reading speed. However, participatory approaches and longitudinal evaluations were rarely employed, and the body of work has disproportionately focused on web-based digital reading. Following the initial coding, we conducted community-specific analyses of individual publications to identify patterns and limitations. Based on these analyses, we offer a set of open research questions and community-specific directions to guide future work.

CCS Concepts

• **Human-centered computing** → **Accessibility systems and tools**; **Accessibility technologies**; *Accessibility theory, concepts and paradigms*; **Accessibility design and evaluation methods**.

Keywords

Literature Review, Systematic Literature Review, Reading, Reading Support, Reading Support Technologies, Reading Comprehension, Languages, Accessibility, Disabilities, Reading Disabilities, Reading Difficulty, Comprehension, Readability, Web Readability, Skimming, Automatic Text Simplification, AI, AI tools, AI for reading, Braille, Braille Literacy, Dyslexia, Blind or Low Vision, Deaf or Hard of Hearing, Aphasia, Alexia, ADHD, Intellectual and Cognitive Disabilities, Color Vision Deficiency, Print Disabilities, Autism

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1 Introduction

Reading is a foundational skill that plays a critical role in a person's educational, professional, and social development [28, 95]. It enables access to knowledge and supports independence and full participation in academic, workplace, and civic life. However, a range of disabilities can impact a person's ability to read and develop literacy skills, including learning disabilities [125, 175], intellectual and cognitive impairments [223], and sensory disabilities [198] that may limit access to written and/or spoken language. Given technology's potential to increase access and amplify the abilities of people with disabilities, research on reading support technologies–conceptualized as technologies that make reading more accessible [97]–can have a significant impact [201]. Human-computer interaction (HCI) and computing accessibility research has shed light on how technologies can support the reading tasks of people with disabilities. However, while recent reviews of accessibility research highlight educational technologies as a common focus of accessibility research [127], the overall foci of HCI and computing accessibility research on reading support technologies more specifically has not been explored.

HCI research on reading support technologies spans more than twenty-five years, beginning with early efforts to explore how computer-based techniques could alleviate reading challenges faced by people with disabilities—such as a work with people with dyslexia presented at the Fourth International ACM Conference on Assistive Technologies (ASSETS) in 2000 [85]. Since then, the research domain has broadened to include a wider range of *communities* [50, 99, 158, 181] and diverse *aspects of reading support*, including readability [74], text comprehension [99], and skimming interfaces [5]. This body of work now appears across several major ACM HCI venues and journals. Like other areas of HCI, research in this domain spans a variety of contributions—from requirement gathering with people with disabilities and the design of interfaces to support meaningful interaction [171], to methodological work on evaluating system performance [13], the adaptation of general-purpose linguistic technologies for creating novel tools [59], and experimental evaluations and user studies involving target users [165].

In parallel, transformative research on technologies that underlie reading support systems have enabled new possibilities [29, 75]. As digital platforms became more widespread and ubiquitous, they introduced new opportunities to *alter text presentation*, e.g., through changes in typography and layout [220], the ability to automatically highlight key content [200], and in-situ provision of synonyms or word meanings [208] to enhance accessibility. Natural language processing (NLP) technologies became increasingly sophisticated, enabling their use as reading support tools in diverse contexts. Early advances focused on lexical simplification—*reducing text complexity* by identifying and replacing difficult words [6]. These were followed by context-aware lexical simplification [30] and eventually data-driven sentence simplification approaches [16], including syntactic simplification [146, 188]. Machine translation also became more common as a means of increasing access to text [20, 122]. Most recently, large language models (LLMs) have begun to transform this landscape by supporting a wide range of text content modifications—including simplification, summarization, augmentation, translation, personalized explanations, and question answering [77, 190, 222, 224]. These advances are significantly expanding the design space for reading support technologies and present new opportunities for HCI researchers [149].

Given the rapid pace of innovation and the fact that HCI research in this area has matured over more than 25 years, now is a timely moment to take stock of the field to identify key trends, themes, and gaps in the literature. To this end, we contribute a systematic review of 101 publications in ACM-sponsored conferences, which include the top venues for HCI and computing accessibility research. Our guiding questions (GQs) included:

GQ1. Which communities of people with disabilities has HCI research on reading support technologies primarily focused on?
GQ2. What research methods and types of contributions are most common in this body of work?
GQ3. What technologies and interface approaches have been explored, and which aspects of reading do they aim to support?
GQ4. What open questions and future research opportunities arise from this review?

The primary contribution of this work is a structured survey and analysis of 101 HCI publications from 2000 to 2024 [216]. We present:

- **Descriptive statistics and temporal trends across the corpus**, including publication types and venues, communities of focus, contribution types, outcomes, proposed technologies, and temporal patterns. Our findings show that most studies focused on people with dyslexia, followed by people who are Blind or Low Vision (BLV), have intellectual or cognitive disabilities, or are Deaf or Hard of Hearing (DHH). Most publications contributed artifacts accompanied by short-term, lab-based empirical evaluations. Technologies varied by community but commonly focused on visual modifications and text simplification to enhance visual and linguistic readability, summarization and concurrent audio-visual presentation to support skimming and navigation, and platforms for literacy development. Most studies centered on digital reading, particularly web-based content.
- **Trends in research methods**. Experiments, interviews, and user studies were the most frequently used methods, with a median of 15 participants per study. We observed limited use of co-design, participatory design, and longitudinal evaluations—highlighting areas for future methodological development.
- **Community-specific trends**, including analyses of work focused on BLV users, people with dyslexia, DHH users, people with intellectual and cognitive disabilities, and others. We found notable differences across communities in terms of emphasis on visual versus content-level interventions, as well as in methodological approaches.

Our discussion (1) outlines general and community-specific challenges, (2) identifies opportunities to explore new aspects of reading, as well as underexplored technologies and interface approaches in this space, and (3) offers open questions for HCI researchers working on reading support tools for different communities of people with disabilities.

2 Background and Related Work

To contextualize our work, this section briefly introduces reading models which helped us define our scope and definitions for this work. Then, we summarize similar literature reviews in HCI and computing accessibility, which helped us narrow down our focus.

2.1 Reading Models and Disabilities

Scientific theories of reading span over 50 years [176], encompassing several unified theories and influential models of reading, as well as definitions of reading disabilities. Gough and Tunmer [84] introduced the *Simple View of Reading*, which defines `reading comprehension (RC)` as the product of `decoding (D)` and `language comprehension (L)`, expressed as $RC = D \times L$. This model suggests that reading difficulties may result from challenges in decoding (often associated with *dyslexia*), language comprehension, or both (referred to as "*garden variety*" reading disability). Building on this framework, Scarborough et al. [182] developed the *Rope Model*, which describes fluent reading as the result of two intertwined processes: *increasingly automatic word recognition* (e.g., phonological awareness, decoding, sight recognition of familiar words) and *increasingly strategic language comprehension* (e.g., background knowledge, vocabulary, syntax). Reading difficulties can emerge from either of these strands and are understood to occur along a continuum [186]. A striking finding from research on reading is the persistence of reading disabilities, with 65–75% of affected children continuing to struggle throughout their education. Developmental models further emphasize the importance of mastering phoneme–grapheme mapping—the alphabetic principle—as a foundation for fluent word recognition [69, 192].

Grounded in these models, our review includes HCI research on technologies that support cognitive and linguistic aspects of reading, such as decoding, comprehension, and readability. We therefore exclude research that only focuses on providing access to the sensory input, e.g., screen readers [31], which are essential for visual access but primarily support input rather than address underlying cognitive challenges of reading for people with disabilities.

2.2 Literature Reviews in HCI and Accessibility

Literature reviews or surveys have been a common contribution of HCI research to identify trends and gaps in the field or present conceptual frameworks for shared understanding [197, 216]. In this section, we reflect on the rich tradition of literature reviews in HCI and computing accessibility to both contextualize and methodologically ground our exploration.

Literature reviews of HCI research have broadly examined large numbers of publications to explore trends in the field (e.g., [43, 121]). Methodologically, most of the literature reviews in HCI have used qualitative approaches to analyze their research publications, yielding themes. Some of the high-level codes used are contribution types (often based on seven contributions in HCI [216]), communities of focus, and methods. Most of the information, such as the topic of work [61] and participant sizes [41], is manually extracted. While some work has employed quantitative methods (e.g., hierarchical clustering or network analysis) to map trends and their evolutions [121], and other work has focused on patents [43] instead of publications, these methods and corpora are less common; most reviews use qualitative methods and analyze research publications.

In computing accessibility, large scale reviews of accessibility research also explored the overall trends in the field, identifying that BLV accessibility received the highest focus, along with motor impairments and people who are DHH [127, 179], which also aligns with the findings of smaller scale surveys [17]. Mack et al. also highlight that the methods most commonly used included usability testing, interviews and controlled experiments with small participant samples, with participatory approaches being underused [127]. They advocate for more inclusive, interdisciplinary, and user-centered approaches in accessibility research.

Most literature reviews related to computing accessibility tend to focus more specifically on particular groups and/or technologies. For example, Spiel et al. conducted critical reviews on research with people with autistic children [194] and people with ADHD [196], identifying issues with normative perspectives and a need for greater inclusion and consideration of the participants' abilities in the research through more participatory and agency-based research. Some also focused on specific technologies across groups, such as authentication techniques across people with different disabilities [17]. Others focus on specific technologies for specific groups, such as studies that surveyed research on social robots to support autism therapy, and mainstream tablets and multimedia players to provide augmentative and alternative communication (AAC) [123, 157]; or specific technologies for people who are Deaf or Hard-of-hearing, including communication-oriented technologies [132], eye-tracking [3] and sign language technologies [34]. Lastly, others take the approach of exploring different technologies for a particular user group, including people who are BLV (e.g., [37, 206]), children with "special needs" (e.g., [24]) and people with dyslexia (e.g. [161]).

The closest literature reviews to this work includes systematic reviews of computer-based reading comprehension interventions for children with autism [110, 159], which focused on whether those can be effective. However, the studies reviewed did not have an HCI focus nor came from ACM-sponsored venues. Other closely related reviews focused on technologies for people with dyslexia, which include several reading support tools [58, 161, 191]. However, these studies, with the exception of [161], did not focus on HCI, had a broader scope encompassing various dyslexia technologies (e.g., diagnostics, writing support), and lacked a comparative analysis of reading support for other disabilities.

Our work takes the approach of focusing on HCI work published in ACM-sponsored conferences on reading support technologies for people with disabilities. This allows us to identify the communities of focus, overall trends and trends by community, and contribute to a better understanding of how HCI and computing accessibility research explores reading support technologies.

3 Method

To understand the current state of accessibility and HCI research on reading support tools for people with disabilities, we conducted a literature survey of conference publications and journal articles published in the ACM Digital Library. Our initial search yielded 141 publications spanning 25 years (from 2000 to 2024)[1], out of which 101 were included in our final analysis. In this section, we describe our dataset creation and coding process.

3.1 Dataset Creation

3.1.1 Keyword Selection. We systematically constructed a list of keywords based on our domain expertise and prior research [127, 179]. To identify relevant communities, we drew on a recent literature review of accessibility publications at CHI and ASSETS [127]. Our keywords span both broad terms referring to people with disabilities and more specific communities. For general disability terms or disabilities not directly tied to reading—we appended read*[2] at the end of the keyword to help focus the search on reading-related work. We also added keywords that we saw as we went through the list (e.g., braille literacy).

Our final set of keywords includes: reading diabilit*, reading comprehension, disabilit* AND reading support, deaf AND read*, hard-of-hearing AND read*, autism AND read*, color vision AND read*, cognitive AND read*, intellectual disabilit* AND read*, learning disabilit* + read*, blind AND read*, braille literacy, dyslexia, aphasia, and alexia.

3.1.2 Inclusion Criteria. After defining our keywords, we established inclusion criteria through a team discussion. In line with ASSETS' focus, we included publications that presented new enabling technologies, studies of how technologies are used by people with disabilities, and explorations of barriers to access. As noted in the ASSETS call for publications, many accessibility-focused projects begin with deep formative work or build on prior engagement with representative users. Therefore, we also included publications

[1]We did not include articles from 2025 because a complete set of papers was not available at the time of submission.

[2]The ACM DL advanced search supports uses * as a wild card for "any number of unknown characters." Thus, using "read*" allowed us to search for variations of the word, e.g., read, reader, reading, readers, etc. etc. We also used this approach with other keywords, e.g., disabilit*.

whose primary contribution was formative or technical in nature. We do not include reading support tools for older adults.

We also chose to focus exclusively on HCI research, given our expertise and the background of the majority of ASSETS attendees. HCI, as defined by the ACM Special Interest Group on Computer-Human Interaction (SIGCHI), is *a discipline focused on the design, evaluation, and implementation of interactive computing systems for human use, along with the study of the phenomena surrounding them.*

Further, to scope our review, we included only publications in conferences and journals within the Association for Computing Machinery's Digital Library (ACM DL)[3]. While we acknowledge that HCI research appears in non-ACM venues, we selected the ACM DL due to its consistent indexing and use of Computing Classification Systems (CCS) concepts, which we used as a secondary reference considering that some earlier publications did not use the concepts and they were updated halfway through our dataset. Nevertheless, the ACM DL's structure readily allowed us to systematically identify relevant publications and determine whether a publication falls within HCI. Our sample should not be considered exhaustive, and we hope this work can spur future analysis of publications in other digital libraries.

To summarize, **our criteria** focused on including ❶ HCI work, published as ❷ conference papers, posters, or journal articles in the ❸ ACM Digital Library, that address ❹ reading support for people with disabilities.

3.1.3 Corpus Creation. We searched the ACM Digital Library for all entries containing our selected keywords. We used "Advanced Search" feature in the ACM DL to search for each keyword individually within the titles and abstracts of the resulting publications, and reviewed the abstract for each search result. To narrow down the number of search results and avoid missing potential publications, we split the year of publication into three categories: before 2015, 2015-2019, and 2020-2024. Relevant publications were recorded in a spreadsheet for final review.

Afterward, we analyzed all entries in the spreadsheet as a team. Our initial search yielded a total of 141 publications, with (N = 101, 71.63 %) included in our final list, which we included as a spreadsheet in our electronic appendix. The rest of this paragraph details the 40 publications we excluded after our initial search: eleven (N = 11, 7.8 %) because they did not make new contributions [216] and twenty nine (N = 29, 20.57 %) based on their content. Among the publications excluded due to their lack of new scientific contribution, some were ACM SIGACCESS newsletter publications, which inherently do not make scientific contributions, such as doctoral consortium submissions (N = 7, 4.96 %) [7, 60, 74, 88, 126, 163, 193] and descriptions of products from a team project (N = 1, 0.71 %) [2]. We also excluded a keynote (N = 1, 0.71 %) [36] , one publication due to the unavailability of its PDF (N = 1, 0.71 %) [1], and one publication that was only an abstract (N = 1, 0.71 %) [38]. Among publications rejected due to their content, one was excluded because it focused on reading mathematics (N = 1, 0.71 %) [98], another on reading code (N = 1, 0.71 %) [130], one on authoring content (N = 1, 0.71 %) [221], and four on writing (N = 4, 2.84 %) [103, 136, 140, 148]. Five publications focused on sensory input (N = 5, 3.55 %) [18, 108, 113, 178, 212]. Three publications did not directly focus on disability (N = 3, 2.13 %) [54, 147, 209]. An additional 13 publications were excluded because they did not focus on reading support technology or provided methodological guidance on how to evaluate them (N = 13, 9.22 %) [32, 68, 72, 100, 104, 116, 117, 119, 141, 196, 207, 210, 211]. Lastly, one publication was excluded because it only focused on technology for diagnosis (N = 1, 0.71 %) [202].

[3]ACM Digital Library: https://dl.acm.org/

3.2 Coding Rubric and Process

We employed both (1) descriptive summarization methods and (2) individual reviews of publications to analyze our dataset. To analyze our publication corpus, we first developed a coding rubric through an iterative process involving two meetings. Prior literature reviews often include dimensions such as contribution type, research topic, user group, technology type, research methods, and innovation type [105]. Motivated by this prior work, along with domain-specific considerations, we designed our rubric to include the following entries:

(1) **Publication Metadata**, including **title**, **year**, **venue**, **page length**, **DOI**, **first author**, and **length of contribution** (using two codes: full and short).
(2) **Types of contributions**, captured in four columns for **primary**, **secondary**, **tertiary**, and **other stated contributions**. We followed the contribution categories proposed by Wobbrock and Kientz [216]: (1) empirical, (2) artifact, (3) methodological, (4) theoretical, (5) benchmark/dataset, (6) survey, and (7) opinion.
(3) **Communities of focus**, using three columns to capture **primary**, **secondary**, and **tertiary communities**, with a fourth column for **additional communities** if more than three were mentioned. We recorded the terminology used in each publication to refer to these communities rather than substituting preferred terms. Finally, we added a column to collate all publications based on their primary community of focus, using the following codes: BLV, Aphasia, DHH, Dyslexia, Other Learning Disability, Autism, Low Literacy, Neurodivergent, Non-Visual Readers (Blind + Dyslexia), ADHD, Intellectual and Cognitive Disabilities, and General Disability.
(4) **Methods used**, recorded across three columns, with the third column listing all additional methods if more than three were used: **primary**, **secondary**, and **other methods**. At the end, we included a new "**primary method column**" and collated all primary contributions to these codes: No User Study, Experimental Study, Evaluation(s), User Study, Expert Evaluation, Pilot study, Interviews, Survey, Focus Group, Co-design, Case Study, Observational Study, Corpus Analysis, Social Media Observations, Eye-tracking, and Longitudinal Study.
(5) **Metrics and evaluation methods**, listing the **metrics used** to evaluate reading performance or the outcomes of the support technology.
(6) **Use of AI**, indicating whether the work involved **artificial intelligence**. We defined AI broadly to include both deductive reasoning systems and inductive models, such as those using machine learning. The two codes were: Yes and No.

(7) **Participant information**, including how **participants were engaged**, **the number of participants** (with breakdowns across studies or groups if applicable), and whether demographic or assessment data—such as **age** (Yes, Yes [Only descriptive term], No), **gender** (Yes, No), **literacy** (Yes, Yes [Metric Specified], No), or **language level**—were reported. We also recorded the recruitment source, if available.
(8) **Contributions** captured the nature of the **contribution** (e.g., tool, design guideline), **intended audience** (Designers, Researchers, and Both), and a description of the **interface studied**, proposed, or developed.

The two authors independently coded an initial subset of (N = 22, 21.78 %) and (N = 27, 26.73 %) publications using the draft rubric and discussed both the categorizations and their interpretations. Afterward, no changes were made to the column names, but the authors discussed their coding approach to ensure consistency, focusing on matching scope and definitions. They then revised their initial codes and split the remaining corpus evenly for coding. After completing the full coding process, the authors collaboratively reviewed all codes and discussed across 3 synchronous meetings to ensure consistency and agreement across the dataset.

For community-specific trends analysis, the authors independently reviewed approximately half of the publications each, taking notes on aspects such as the work's focus, unique aspects of focus (e.g., readability, comprehension, and skimming), technology design, and methodological details. They then discussed their notes in two 90-minute synchronous meetings, going community by community, focusing on the takeaways from each paper to match the level of detail. These meetings were recorded and referred to while drafting the trends for each community (presented in Section 4.3).

4 Findings

4.1 Overall Descriptive Trends

4.1.1 Publication Types and Venues. Our dataset consisted of a total of 101 publications (53 full-length publications and 48 short publications). The top three venues were the SIGACCESS Conference on Computers and Accessibility (ASSETS = 29, 28.71%), followed by the Conference on Human Factors in Computing Systems (CHI = 13, 12.87%), and the International Web for All Conference (W4A = 9, 8.91%).

Some work focusing on technologies for children appeared at the ACM Interaction Design and Children (IDC = 4, 3.96%). The ACM Transactions on Accessible Computing (TACCESS = 3, 2.97%) was the top journal venue. Other venues with multiple publications included the International Conference on Human-Computer Interaction (INTERACCIÓN = 4, 3.96%), ACM International Conference on Multimodal Interaction (ICMI = 2, 1.98%), International Conference on Intelligent User Interfaces (IUI = 2, 1.98%), ACM Designing Interactive Systems Conference (DIS = 2, 1.98%), the Brazilian Symposium on Human Factors in Computing Systems (IHC = 2, 1.98%), and the International Conference on Digital Society and Artificial Intelligence (DSAI = 2, 1.98%).

4.1.2 Communities. Dyslexia (N = 28, 27.72 %) was the highest focus of reading support, closely followed by people who are BLV (N = 18, 17.82 %), have intellectual and cognitive disabilities (N = 18, 17.82 %) or are DHH (N = 16, 15.84 %), with some overlap between interventions for people with dyslexia and BLV categorized as "non-visual readers" (N = 2, 1.98 %). Other communities of focus included people with low literacy (N = 4, 3.96 %), aphasia (N = 3, 2.97 %), autism (N = 3, 2.97 %), learning disorders/disabilities (N = 2, 1.98 %), down syndrome (N = 1, 0.99 %) and alexia (N = 1, 0.99 %). A few publications also focused on neurodivergent readers (N = 1, 0.99 %), readers with ADHD (N = 1, 0.99 %), and general disability (N = 5, 4.95 %). Across these communities, around one fifth (N = 22, 21.78 %) of the publications focused specifically on children. The majority of the work has been in English and western contexts, but some work has investigated other languages like Spanish (N = 6, 5.94 %) (e.g., [97]) and technologies for non-western readers [47].

4.1.3 Contribution Type and Outcomes. We found that most primary contributions consisted of artifacts (N = 45, 44.55 %), closely followed by empirical findings (N = 41, 40.59 %), mostly consisting of evaluation of the artifacts. However, we saw fewer examples of empirical findings about the needs of the potential target user groups for the technologies. Furthermore, among the evaluations, about half evaluations were lab based (N = 18, 17.82 %), generally focusing on the short-term impact of interventions when reading texts selected by the researchers. Four studies primarily contributed metrics or methodological insights (N = 4, 3.96 %).

4.1.4 Technologies Proposed. The interventions proposed included augmenting text through visual elements such as icons, images or videos (e.g., in sign language), which aimed to facilitate the readers' comprehension. Other approaches included summarizing texts to support participants' speed in identifying relevant content in a text through navigation and skimming. Text simplification was also employed both at the word (lexical) and syntactic levels to reduce the linguistic readability or complexity of texts. Other works focused on visually modifying the texts (e.g., modifying properties of the typography or layout) to increase visual readability. However, while the latter two categories focus on different types of readability (e.g., proposing visual changes for visual readability, or changes to the content for linguistic readability), this distinction is rarely made explicit and is only evident based on the type of intervention proposed.

Web was the most commonly studied platform (N = 38, 37.62 %), with only a few publications supporting printed texts (N = 3, 2.97 %) and e-books (N = 1, 0.99 %). Touch interfaces (N = 8, 7.92 %), such as smartphone apps, were also used as interventions, though mobile reading tasks were rarely the primary focus. Some publications explored use of tablets or tangible systems (N = 5, 4.95 %) to support the development of reading and literacy skills, often targeting children with disabilities or readers with low literacy. Across the board, AI-based underlying technologies supporting reading support tools initially employed rule-based approaches (e.g., summarization and simplification) and gradually began incorporating more data-driven and AI-based methods. Overall, AI was only present in less than one-fifth of the works (N = 17, 16.83 %).

4.1.5 Temporal Trends. As illustrated in Figure 1, we observed a gradual increase in published work, with two or fewer publications per year until 2007, followed by a steady rise in subsequent years. Early research primarily focused on dyslexia, BLV, and DHH communities, with increasing attention to intellectual and cognitive disabilities in more recent work. A comparison of methods used over time also reveals a growing trend toward more formal experimental evaluations as compared to informal user studies.

4.2 Trends by Research Methods

4.2.1 Methods. Across the analyzed studies, experiments were the most common method, appearing in (N = 27, 26.73 %) instances — (N = 22, 21.78 %) as the primary method and (N = 5, 4.95 %) as a secondary. This was closely followed by user studies, which appeared (N = 22, 21.78 %) times, with (N = 13, 12.87 %) reported as primary. Interview studies were also prevalent, with fourteen total studies using it as primary method (N = 14, 13.86 %). Survey methods appeared in (N = 7, 6.93 %) studies, while eye tracking was used in (N = 6, 5.94 %), often as a complementary technique, and only twice as primary method (N = 2, 1.98 %).

Less frequent but notable methods included expert reviews (N = 3, 2.97 %), mixed-method pilot studies (N = 3, 2.97 %), and corpus analysis (N = 2, 1.98 %). Only (N = 2, 1.98 %) studies employed co-design as a primary research method. (N = 19, 18.81 %) publications did not report any empirical methods, often solely focusing on describing an artifact. Figure 2 shows the number of publications using different primary research methods.

4.2.2 Participants. The number of participants reported per study showed significant variation, with most studies involving small sample sizes and a few with large numbers of participants (median = 15, σ = 22 among studies with less than 100 participants). Most publications reported participant data from a single study (N = 65, 64.36 %), typically with totals ranging from 1 to 20 participants. A subset of publications (N = 12, 11.88 %) reported multiple studies or participant groups, often breaking counts into separate roles or phases (e.g., design, evaluation, expert review). A small number of publications (N = 7, 6.93 %) accounted for exceptionally large participant totals (more than 100), including one reporting data from 5000 app users, one reporting a survey with 819 participants and another with 459. These studies typically relied on large-scale survey deployment or crowd-sourced recruitment platforms. 28 publications reported no participant data (N = 28, 27.72 %), either because they did not include human subjects (e.g., system design, prototype descriptions) (N = 19, 18.81 %) or the participant counts were missing or unreported.

Age was included in about half of publications (N = 51, 50.5 %). Out of those, some (N = 32, 31.68 %) explicitly provided data, while others just included descriptive labels, e.g., "Secondary-level students" or "children." Participants' gender was reported in less than half (N = 45, 44.55 %) cases and reported only in one study in one case. Also relevant to this context, only a few (N = 11, 10.89 %) publications reported participants' literacy levels. Three studies [8, 11, 12] used the Wide Range Achievement Test (WRAT) [213]. Another study reported results from a diagnostic test, the "lea" assessment [86]. Some studies reported proxies such as educational level [172] or Braille knowledge [134, 172]. In a few cases, literacy was measured but not reported [124]. Other mentions varied in specificity and format, often referencing recruitment context (e.g., "Recruited from the same school") or indirect indicators (e.g., "Measured, but not reported").

Most studies did not report recruitment sources. Among those who reported, sources varied widely across the studies, with most being mentioned only once. Common channels included schools (N = 3, 2.97 %), online platforms and mailing lists (N = 3, 2.97 %), and universities or disability support centers (N = 2, 1.98 %), e.g., "Disability resource center at the university" [4], "University campus" [10]. Some studies recruited through specialized organizations, such as the "Dyslexia Institute of Indiana" [4], "Brazilian Association of Dyslexia" [59], and "CRMF in Spain" [39]. Others relied on local communities, social media, or snowball sampling via prior contacts. A few recruitment efforts were more targeted, involving professional Braille instructors, students with formal diagnoses, or specific educational programs (e.g., Landmark College) [217].

4.3 Trends by Communities

After grouping the publications by communities of focus, we identified the technologies commonly proposed for each group, along with the aspect of reading they aim to support. This section describes these trends, organized alphabetically by community of focus.

4.3.1 Blind and Low Vision. Most research on providing reading support for BLV readers has focused on aiding *skimming and navigation*, especially when using screen readers, to reduce cognitive overload. The other main category focuses on *understanding and supporting technology-assisted braille literacy development.*

Early explorations by Harper et al. focused on automatically providing a "gist" summary to allow a BLV reader to determine whether to read an article. Ahmed et al. also explored how to support non-visual skimming using shortcuts, [4] or pinch gestures in touch interfaces [5], to navigate through summaries of varying lengths and complexity. Experimental studies demonstrated that readers were able to arrive at answers for questions more quickly and with less difficulty. Similarly, El-Glaly et al. explored touch-based interactions to skim through context by adjusting a screen readers' speed based on the users' finger location over the text [70]. They built an acoustic model to support comprehensibility when adjusting the screen-readers' speed. An evaluation demonstrated that this interaction reduced participants' reading and answering time.

While the studies above focused on adjusting speed, Park et al., in turn, focused on adding navigational aids based on readers' behaviors when reading a research paper to support low-vision readers' navigation [151]. Through interviews, the researchers found that low-vision readers may navigate to different parts of research papers to assist in comprehension (e.g., by visiting a different section to search for more details). Their evaluation suggested that hyperlink-based navigational aids were useful to skim different parts of the paper, but also introduced issues given that low-vision readers also wanted experience the papers like other readers would. Lastly, Guerreiro et al. explored yet another approach by leveraging the *cocktail party effect* to provide different portions of a text as concurrent speech and allow the reader to identify the most relevant source [89, 90]. Their evaluations suggest that BLV users are able to keep up with two to three concurrent speech channels, even at an increased speed, which outpaces simply increasing the speed of a single channel.

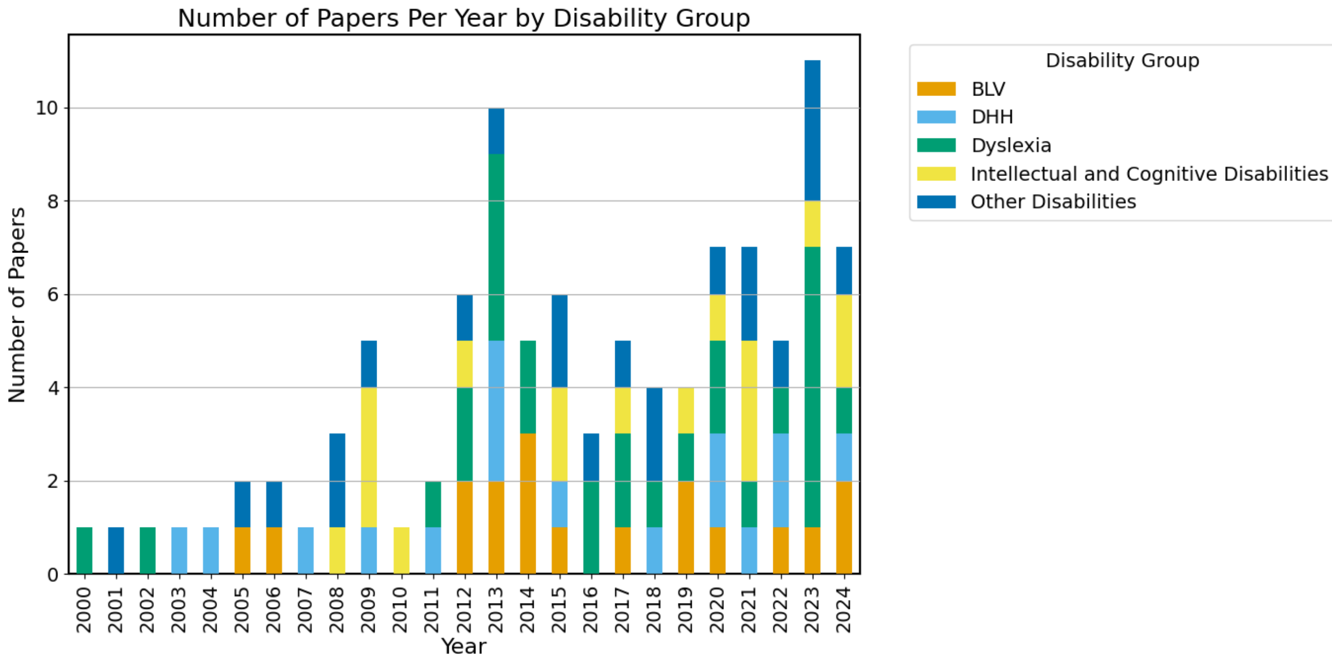

Figure 1: Number of publications primarily focused on different communities between 2000 and 2024. "Other Disabilities" includes disabilities not classified as BLV, DHH, Dyslexia, or Intellectual and Cognitive Disabilities, including Aphasia, Alexia and ADHD.

Research on supporting both written and braille literacy development has explored both software-based and tangible interactions, with a general focus on supporting the interaction between mixed-ability parents and children (e.g., sighted parents of BLV children and vice-versa). For example, Milne et al. introduced a digital interface that allows blind children to enter Braille patterns to play digital games such as flashcard games and hangman [134]. Their evaluation suggested that the games were accessible and engaging, and had the potential to be effective tools for learning braille. Similarly, Frey et al. explore BrailleTouch, a touch-based interface to use braille as a text input, as a potential tool for braille literacy development [76]. Their participants, which consisted of braille teachers, found the idea promising and proposed additional ideas to make it work such as adding raised dot landmarks. Gadiraju et al. proposed "BrailleBlocks" as a tangible system to support BLV children learn and practice Braille with sighted parents [78, 79]. The toy blocks, which allow children to build braille letters, are paired with a digital guide for the sighted parents to view how the letters should be assembled. An evaluation suggested that the blocks can support them in working together towards this task. Iqbal et al. [102], in turn, focused specifically on supporting sighted parents of BLV children in learning Urdu braille using a web-based translator and a picture-based quiz interface where parents have to identify the braille pattern that matches a given picture. Preliminary findings showed that participants thought the tool responded to their needs reasonably well. Lastly, Guerreiro et al. interviewed blind adults and identified lack of resources and interactivity as key barriers to learning braille [87]. They thus proposed novel software and hardware to increase access to braille learning tools, which also included games.

Most of the studies with BLV parents of sighted children then focused on understanding current practices and how technology could support their co-reading practices with their children. Storer and Branham analyzed social media posts from blind parents to identify their co-reading practices with their children [199]. Their findings suggest that not only BLV parents should be involved in the design of technologies to support these co-reading activities, but their children should also be considered active participants in an interdependent relationship. Park et al. explored a similar research question through interviews [152]. They found that images in children books are important to BLV parents, who may use technology-based support such as crowdsourced platforms and AI to obtain image descriptions, and that smart speakers have potential to support these reading activities. Cassidy et al.'s interview study with BLV parents further highlights the importance of considering intimacy when designing technologies to support these co-reading activities [46]. Lastly, Figueira et al. explore the potential role AI could play in this context, finding that the systems should serve a supplementary role to BLV parents' existing practices and access labor for co-reading, and adapt to the parents' teaching styles to avoid imposing additional labor in adjusting to AI-imposed styles.

4.3.2 Deaf and Hard-of-Hearing. Research focused on providing reading support for people who are DHH has mostly focused on either augmenting the text by adding supporting information, or modifying the text to simplify it. For example, Bueno et al. conducted an exploratory study with Deaf students to explore their

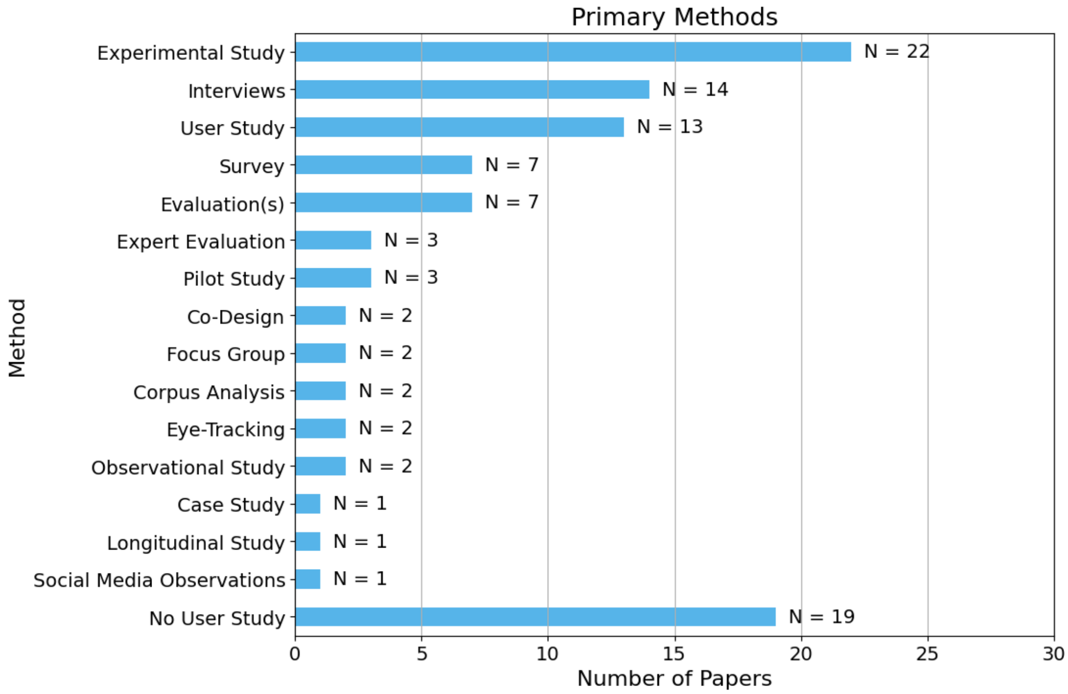

Figure 2: Primary methods employed in publications in our corpus. Several studies employed multiple methods. This figure summarizes findings based on "primary method column" described in Section 3.2.

needs and suggestions for adapting texts in e-learning contexts, and identified that both augmentation and simplification could be beneficial [39]. As a result, their system incorporated highlights to indicate difficult words. The system could then, in order, provide synonyms, images or a sign language video to support the reader in understanding the difficult words. Chung et al., in turn, focused on simplifying sentences by either reducing their syntactic complexity, or using a graphical representation to illustrate the relationship between different parts of a sentence [50].

Others explored early approaches to incorporate sign language as an alternative to text in contexts such as Brazil [55], Mexico [156], South Africa [52], and the United Kingdom [158]. These explorations focused specifically on providing signs for individual words [55, 156, 158] or short snippets of text [52, 55]. In addition to pictures and sign language videos, Petrie et al. also explored animations of a human mouth and digital lips to potentially assist lip readers [158]. However, in an evaluation with 15 DHH readers, most preferred sign language videos and pictures. Malzkuhn et al. also proposed augmenting text with sign language videos specifically in a storybook app to support children's literacy development based on ASL principles [129]. Also focusing on DHH children, Cano et al. explored existing gamified applications to support reading development in Spanish and proposed an interface that leverages visual elements such as icons to support literacy learning [42].

Early works focused on modifying the text through simplification proposed both lexical and syntactic approaches to provide reading support to DHH readers in Japanese and English [101]. With a technical focus, the researchers explored how to assess texts' readability through a survey of literacy educators for deaf students. They then used the survey results to build a readability assessment model and discuss their paraphrasing approach. Alonzo et al., in turn, explored the needs and requirements of DHH readers with experience in the computing field for lexical and syntactic approaches to text simplification, and their perspectives on the social acceptability of such tools [8, 9]. They found potential interests, with lexical simplification potentially seeming more applicable, but syntactic simplification being perceived as useful, too. However, users also had concerns about the social acceptability of reading support tools framed as an assistive technology given that needing reading support could be confounded with a lack of general competence or intellectual ability. An evaluation of a prototype for lexical simplification provided evidence for perceived benefits from the tool, which may require providing users with the autonomy to make requests, to ensure equal access to the original text [11]. They then explored the full design space of ATS with DHH readers, identifying design preferences for lexical and syntactic simplification [10]. An evaluation of the resulting prototype revealed that participants found lexical simplification more useful, but some of the resulting designs for syntactic simplification also introduced rereading behaviors as participants wanted to compare the simplifications to the original versions.

Motivated by the fact that most evaluation methods tend to rely on the same linguistic skills these systems intend to support, Alonzo et al. also conducted methodological research on how to evaluate the complexity and the fluency (or grammatical correctness) of simplified texts with DHH readers [12, 13]. They found that different metrics may capture different characteristics of simplified texts, with subjective judgments being more effective at measuring differences in complexity, while reading speed was more effective for fluency. Similarly, Mich et al. proposed and evaluated e-drawings as an evaluation method for linguistic understanding with DHH children, finding promising results that could be better supported by better scoring criteria for the drawings [133].

4.3.3 Dyslexia. An early HCI work on dyslexia by Rello et al. [171] categorized challenges faced by people with dyslexia using insights from accessibility and neuroscience research. They identified three types: surface dyslexia, phonological dyslexia, and mixed (both). Surface dyslexia often involves confusion with homophonic or pseudo-homophonic words, such as weather and whether [154]. Phonological dyslexia includes difficulties with orthographically similar words (e.g., addition vs. audition) [71], number and letter recognition, and errors related to lexicon and syntax—such as word additions or omissions, word recognition and recall issues, functional word substitutions, and confusion with small words. Mixed dyslexia, which combines both types, is typically discourse-related and may present as fixation issues or difficulty recognizing punctuation [142]. Technological interventions for people with dyslexia have been explored for over two decades and focused on different types of dyslexia [65]. These technologies have focused primarily on the *visual presentation of text*, and less frequently on its *content*.

Early work focused on enhancing readability by *modifying visual parameters* such as foreground/background color, typeface, font, spacing, and text width. Notably, Rello and Baeza-Yates [164] evaluated different fonts for readability, and provided specific recommendations. In a follow-up study [166], they found that sans serif, monospaced, and roman fonts significantly improved reading performance over serif, proportional, and italic styles. Other work has explored additional visual adjustments. For example, de Santana et al. [59] presented a customization toolbar to improve the presentation of web content. Preliminary findings from four participants revealed that the most useful customization features are text size, text alignment, and link color, and highlighted the importance of end-user configurability. Some of the work has also been comparative in nature, e.g., comparing the benefits from using background colors on screen readability [169]. Results showed that background color significantly affects reading performance for both dyslexic and non-dyslexic readers: "warm hues" (peach, orange, yellow) led to markedly better outcomes than "cool tones" (blue, blue-grey, green).

There has also been research on supporting people with dyslexia in reading their own writing through temporary visual modifications of the text [85]. The main finding was that adapting screen configuration to personal preferences can aid people with dyslexia's ability to read, while also revealing that manipulation of other visual parameters such as character reversals should be further investigated.

There has been relatively little cross-platform work—such as on e-book readers [168] and mobile devices [91]—and these studies include limited or no user evaluations.

An interesting direction has been on highlighting the words in text that the reader is focusing on. Some of the work in this domain has explored the use of eye tracking to highlight a word while masking surrounding content, with the goal of improving reading speed [183]. Niklaus et al. [143] proposed digital rulers to help users constrain their focus to specific lines or paragraphs and reduce crowding in the visual field, identifying benefits from the intervention. Other work has looked at technology for isolating enlarging one word at a time [27]. Researchers have emphasized the importance of interventions aimed at improving *reading speed* [118].

While most work focuses on visual presentation, some has explored *text content* as well. Rello and Baeza-Yates [165] created an application, DysWebxia, that show synonyms on demand for complex words, specifically for people with dyslexia, and conducted an evaluation. The results indicated that the new algorithm produced higher-quality synonyms than a frequency-based baseline, and participants rated DysWebxia as highly usable. Tools that offer synonyms to support comprehension in mobile readers have also been proposed [167], along with conceptual maps that aid readability though they show mixed results for understanding [172]. Multimodal approaches have also been explored, such as combining imagery, color cues, and read-aloud features [144]. Others have used text-to-speech technologies with rhythmic emphasis to improve prosody and highlight important content [120].

Research with children with dyslexia has focused on developmental skills [91], sometimes using tangible tools like "PhonoBlocks" [73] and multimodal interfaces incorporating images and sound [81]. Findings showed benefits of distinct color-coding of similar glyphs, guided tracing activities, and audio pronunciations. Other studies have leveraged eye-tracking to identify areas of fixation and provide real-time support, such as visual cues and read-aloud features to enhance readability [66]. Some work has also explored visual representation strategies for printed text in children's reading tasks [92]. Design recommendations include offering customizable typography and color settings, streamlined batch scanning, multisensory interactive reading with synchronized highlighting and audio, child-friendly onboarding, and robust offline-first privacy safeguards.

Some of these studies on technologies for people with dyslexia employed user-centered design processes, with a strong emphasis on visual presentation and text adjustments. Key outcomes often consist of design guidelines, covering aspects like visual appearance, content structure, navigation, and simplification [135]. Web extensions have emerged as a common intervention approach in this space, with initial findings suggesting they can effectively fragment problematic grapheme pairs to ease reading for users with dyslexia [155]. However, there is comparatively less user-centered work focused directly on content. Some tools address content-level support but often lack evaluation or show mixed results with unclear benefits [128].

4.3.4 Intellectual and Cognitive Disabilities. Early research has offered methodological guidance for evaluating reading support tools. For example, Huenerfauth et al. [99] found that Likert-scale questions were less effective than comprehension questions—a finding that contrasts with methodological research involving people who are DHH [12, 13]. A follow-up study on text simplification further supported these results [181]. Other work has designed tools to evaluate the output of reading support tools and accessible text

[180]. Findings showed no difference in task difficulty between the mobile app and a traditional paper-and-pencil comprehension test.

Observational studies have also examined the reading behaviors of people with intellectual and cognitive disabilities, resulting in design guidelines for document accessibility [189]. Other observational work has explored the potential of summarization as a support strategy [21]. The study showed that an article's relevance to a person's interests matters more than its length, and that providing summarized text—especially when paired with familiar words and supporting images—makes content easier for individuals with intellectual disabilities to understand. Additionally, researchers have developed tools such as the Simplification Annotation Editor [15], which supports the manual annotation and evaluation of simplified text.

Heuer and Glassman [97] proposed an Accessible Text Framework to guide researchers on how different tools can be combined and how to implement individual tools. Some tools provide lexical simplification alone [137], while others allow users to paste in text for simplification [139]. Additional work has explored multimodal and multi-strategy approaches, such as converting text to images, offering simpler synonyms for complex words, and applying syntactic simplification techniques [177]. These tools have been evaluated with users with cognitive disabilities [138], and web extensions have been a common delivery platform, often designed with multiple user groups in mind [170]. Some of the applications include an accessible email client [177]

4.3.5 Others. Other communities of focus, which did not receive as much attention in our dataset, included *people with ADHD*, *aphasia*, *alexia*, *autism*, *low literacy and other learning disabilities*, and *neurodivergent students*.

Based on an interview study with children with ADHD, Cortazar proposed a tabletop social robot that can monitor a child's behaviors and provide non-verbal feedback to aid focus during independent reading tasks, while also recording the interactions for later review [53].

Langford et al. co-designed a reading therapy app with readers with aphasia and alexia, which used gamification to support spoken and written word association [115]. Given that people with aphasia can also recognize visual images, Tee et al. explored developing an image-based visual language to translate written recipes into images, finding that it could support people with aphasia in cooking more independently [205]. And, in addition to providing images, Devlin and Unthank proposed using lexical simplification to jog aphasic readers' memories using simpler synonyms [63].

Using eye-tracking, Yaneva et al. explored the needs of adults with ASD for accessible texts, finding that readers with ASD tended to rely more on images and visual cues, and had diverse ratings of text difficulty, with texts written in Plain English appearing more appropriate based both on subjective judgments and their reading speeds [219]. Focusing on children with ASD, Rasche et al. proposed a system that would allow children to scan labels attached to everyday objects to see text and visuals related to the objects (e.g., doors), and play games to help reinforce developing literacy skills [160]. Similarly, Gomez et al. proposed a gamified tablet app that uses images attached to words to support children with ASD's literacy development in Spanish, which also supports QR codes attached to physical objects [83]. A preliminary study suggested that children were motivated to play and understood how to use the platform.

Lunte and Boll proposed using eye-tracking to provide gaze-based support for children with low literacy, such as highlighting letters that are difficult to distinguish or visualizing syllables when children fixate on a specific word [124]. Similarly, Wong et al. proposed using eye-tracking to identify reading difficulties in neurodivergent students based on an empirical study where students voiced difficulties as they read [217].

Aluisio et al. also proposed using text simplification to support the reading tasks of adults with low literacy in Brazilian Portuguese [14]. In addition to text simplification, Ribeiro et al. also proposed using audio recordings and images to support low literacy readers in Brazil using web pop-up windows [173]. Similar forms of support were explored by Galletti et al. to support students with learning disabilities [80], while Pannim et al. found that such interventions, in addition to others like mind maps, influence Thai students with learning disabilities' adoptions of mobile apps to support their reading comprehension [150]. Ghaznavi et al. also explored crowdsourcing audio recordings by volunteer readers to support low literacy readers, who could upload images of printed text to obtain recordings [82].

Lastly, we found studies that mentioned several disabilities as motivation, or disability more generally for their work, which included several technologies already mentioned above. These included, for example, text simplification [33], visual augmentation [174], converting text to images [23], and summarizing printed text through the use of a camera [25].

5 Discussion

This section reflects on trends in focused communities, research methods, contributions, and support technologies/interfaces, contextualized within broader HCI and accessibility literature, identifying key gaps. We conclude by posing general research questions for reading support technologies and specific questions for research with individual communities.

5.1 Communities of Focus (GQ1)

Prior reviews of accessibility and HCI research identify BLV users as the most frequently studied community, representing approximately 43.5% of the work [127]. In contrast, our review found that people with dyslexia were the most common focus (N = 28, 27.72 %). The prominence of BLV research in prior work has been attributed to funding priorities, the public visibility of BLV individuals, and the perceived tangibility of visual accessibility challenges for HCI researchers [127]. Since our review centers on the cognitive aspects of reading rather than sensory access, we excluded studies that focused solely on sensory access technologies, such as screen readers. While most BLV-related research has emphasized sensory access technologies, braille reading has received comparatively little attention—often mentioned briefly or omitted altogether [37]. Our findings point to important opportunities for future work on braille technologies and on enhancing the accessibility of screen reader output, as discussed further in Section 5.4.

Although HCI research on reading support technologies for people with dyslexia is the most widely published—perhaps because early work in this space focused on dyslexia and provided a foundation for subsequent research [85]—our findings highlight that significant gaps remain, including a lack of work on content-based support. Other communities of focus included people with intellectual or cognitive disabilities and DHH readers. Notably, we observed very limited work on some communities who face significant challenges with reading [19, 162], with fewer than five publications each focusing on individuals with aphasia, ADHD, autism, and other disabilities. Research involving individuals with intellectual and cognitive disabilities was often presented as a unified group in prior work, which can obscure important differences, abilities, and needs within these communities.

5.2 Research Methods and Contributions (GQ2)

User studies and single experimental studies were the most common methods, consistent with broader trends in accessibility research [127]. A notable parallel with general accessibility and HCI work is the limited use of co-design and participatory design methods—only three studies in our dataset explicitly employed such approaches as primary or secondary method [10, 115, 189], often involving participants in a single session [22]. Participatory methods are valuable for involving end users throughout multiple stages of design and are particularly useful in contexts where recruitment is challenging, as they support smaller sample sizes. However, these methods can be difficult to implement, especially with populations where sustained verbal communication may be challenging, such as people with aphasia [106]. Additionally, surveys and user study materials are often presented in written text, which may present further barriers for some people with disabilities.

Several studies recruited over 50 participants, and some involved hundreds. Larger studies often relied on methods such as crowdsourcing via MTurk [143], large-scale surveys [97], or app usage data [91], and frequently included nondisabled participants such as "strong readers" [165]. Prior work has noted the difficulty of recruiting large samples in accessibility research and has argued that small sample sizes are not necessarily a limitation. Rather, they can help avoid overburdening marginalized participants and reduce "access labor" [26, 127, 184]. The participant numbers we observed were comparable to those in recent analyses of CHI 2020 papers [114].

Demographic reporting was inconsistent. Gender was omitted in several publications, and age was often described only in general terms. Reporting of age and gender was lower compared to broader HCI trends—for example, an analysis of CHI papers from 2016–2021 found that 90% of studies reported gender [48], whereas in our dataset, less than half did. This may be attributed to the types of evaluations observed in our corpus, which were often brief assessments of artifacts. A small number of studies—typically methodological in nature—explicitly reported participants' literacy levels, using standardized assessments such as the Wide Range Achievement Test (WRAT) [11–13, 213] or diagnostic tools like the "lea" test [86]. Other studies used proxies such as educational level [172]. However, more consistent reporting may be necessary to facilitate comparisons across studies.

We also observed that several studies engaged participants without disabilities, a pattern seen in some accessibility research [127]. These participants were typically involved as design experts [135], comparison groups (e.g., "strong readers") [165, 219], or proxies for the intended users [50]. Prior scholarship has critiqued such practices for framing people without disabilities as the "norm," potentially reinforcing ableist assumptions or implying that disabled users should strive to match that standard [57]. The use of proxy participants raises similar ethical concerns, particularly when their experiences diverge significantly from those of the intended users [195].

Finally, we saw just one longitudinal study [134], and a few field deployments, but most studies were lab-based short-term evaluation studies. Thus, more longitudinal studies may be needed to explore the long-term impact and ecological validity of the proposed technological supports.

5.3 Technologies, Interfaces, and Aspects of Reading (GQ3)

We found that most publications in this domain focus on web-based reading tasks and use interfaces that provide support within the reading environment. This highlights several opportunities for a broader focus on other forms of reading. For example, research had observed that DHH professionals in computing still read printed text often [8]. While we see a few studies on using smartphone cameras to support reading printed text (e.g., [82]), recent research has proposed novel interactions to augment textbooks through smart glasses and augmented-reality (AR) [49], which suggests additional possibilities for reading support technologies for printed texts. Mobile reading has also become more prevalent [187], and may introduce different preferences for formatting [40], which may impact how reading support technologies are implemented. Thus, the current focus on the web may miss some of these other forms of reading, which could also potentially benefit from reading support.

The growing prevalence of LLMs to power HCI research [149] and their potential to support many of the technologies explored makes them candidates for increasing reading support technologies powered by LLMs. In fact, we have already seen recent publications using LLMs to provide reading support (e.g., [222] presented at CHI 2025). Most LLM-based interactions are using conversational interfaces, or chat-bots, which bring challenges and opportunities, and are changing social norms and expectations [35]. These new norms and expectations may bring new opportunities to alleviate concerns around the social acceptability of reading support tools (e.g., [9]). However, they may also bring challenges in that we saw very few studies with conversational or Q&A interfaces. Thus, researchers may not necessarily generalize existing findings to these new conversational interfaces, and should carefully explore how such interfaces compare to the existing research.

We also observed that the technologies and aspects of focus differed across user groups. For example, research with BLV readers tended to focus more on skimming and navigation, and literacy development; research with DHH readers focused more on augmentation and overall simplification of the content; while research with dyslexic readers focused mostly on visual modifications and word-level modifications of content. However, taking a more holistic perspective could enable new perspectives. For example, research has shown that people who are DHH may have higher visual abilities [3], so technologies that support skimming (typically tailored for BLV readers) or visual modifications (typically tailored for dyslexic readers) could hold some benefits. Further, while non-visual reading does introduce potential navigation challenges, texts may still be complex to understand. Thus, providing content modifications for BLV readers may still be useful, but may also introduce new interaction challenges such as how to modify the content in ways that still allow a reader to compare to the original content. Similarly, considering that some technologies for dyslexic readers aim to increase reading speed, further exploring skimming and navigation support could potentially be beneficial. Furthermore, LLMs can provide variable output, which may impact the reliability of the results. Thus, we hope that our identification of the technologies explored can enable new ideas for how to support different communities of readers with disabilities, but that these are evaluated carefully to ensure appropriate design.

5.4 Open Questions & Future Research Opportunities (GQ4)

Drawing on the findings and discussion from the preceding three subsections, we synthesize guiding questions for researchers and practitioners. Inspired by other HCI literature reviews [149], we present both general questions (denoted by G), applicable broadly to research on reading support tools for people with disabilities, and specific questions (denoted by S), focused on research with and for particular disability communities. Our general questions are intended for reflection, not necessarily as direct research questions; researchers should explore more specific inquiries within each.

General Questions

- G **How can research on reading support tools be more deeply centered around the needs of specific communities, including underserved communities, and employ more participatory approaches?** Our analysis revealed broad participant terms grouping heterogeneous communities like "non-visual readers", "low literacy users", "intellectual and cognitive disabilities", etc. Furthermore, even within communities of people who are DHH or BLV, the needs for reading support may be heterogeneous (e.g., [8]). As the field matures, focus should shift towards understanding the specific abilities and challenges of each community to create tools that align more directly with those. Further, surprisingly little work exists on support tools for communities facing reading challenges, such as people with ADHD, autism, and aphasia, which future research should address. Lastly, we also found that only three works in our corpus employed participatory methods. Reviews have mentioned this as a limitation [127], and future research should study how to enable this without overburdening participants, and navigating the inherent difficulties of participatory design with some communities such as people with aphasia [107].
- G **How can participants be involved in evaluating reading support technologies in more longitudinal and ecologically valid ways, and that allow for better reporting to allow comparisons across studies?** A single work employed longitudinal studies. These studies are important for evaluating reading support as they track the sustained impact and long-term effectiveness of interventions on developing reading skills over time. We also observed significant variability in the reporting of gender and other demographic characteristics (e.g., age, race, etc.). Only three works directly reported literacy test results, while others provided diagnostic results or general descriptions, highlighting a need for greater consistency in reporting participant demographic information and literacy measures.
- G **How can researchers better select and report the texts used for evaluation to allow for better comparisons across studies, and what metrics should be employed and reported when evaluating reading support technologies or the underlying technologies that support them?** Prior work evaluating reading support has used text from diverse sources, ranging from scientific articles [10] to newspaper articles [50]. More methodological research is needed to determine the most appropriate text sources for evaluation. Our analysis also revealed a notable disparity in methodological research on evaluating reading support technologies across disability groups. Surprisingly, despite being the most studied population, there is a relative dearth of methodological work on evaluating tool performance for individuals with dyslexia, in contrast to the more established evaluation frameworks observed in research with DHH users [11–13] and individuals with intellectual and cognitive disabilities [99]. Furthermore, we observed that the effectiveness of certain metrics varies across communities; for instance, Likert scales yielded valuable insights with DHH users but proved less informative compared to comprehension questions with other groups. This inconsistency underscores a critical need for systematic research into appropriate and meaningful metrics for assessing the efficacy of reading support tools tailored to diverse disabilities.
- G **How can the technologies explored in current research be applied to languages other than English or romance languages? What new possibilities might those languages and interfaces bring?** We found only six publications focusing on Spanish and very few in a non-Western context.
Languages vary across various dimensions. They differ in morphological complexity (e.g., agglutination—a process where words are formed by stringing together morphemes—common in Finnish and Turkish [67]), word-order flexibility (e.g., in Hindi and Czech [153]), and script systems (e.g., right-to-left *Abjads* like Arabic [56] or logographs like Chinese [204]), each of which presents unique simplification challenges and requires tailored design approaches for content restructuring, paraphrasing, and lexical or syntactic substitution. Similarly, language users also vary not only in the number of languages they know but in how they draw on them: some routinely translate between languages to preserve meaning, others rely on transliteration to read unfamiliar scripts [214], and many engage in translanguaging [145]—switching languages or scripts

within a single interaction to leverage their full linguistic repertoire. Recent work on language justice in the context of captioning has critiqued the implicit or explicit focus on English in HCI and accessibility research [62]. Other work has also highlighted how disabled people navigate multilingual access within broader social, cultural, and linguistic structures [44, 45, 93, 94, 109, 218]. These works suggest that by centering language, decentering fluency, and embracing linguistic fluidity, language accessibility research can advance disability justice. Researchers working on reading support technologies should engage with reading theories for different languages and design technologies with the needs of people with disabilities whose first languages are other than English in mind.

- G **How can the technologies explored in current research be applied to broader reading interfaces beyond the web (e.g., mobile devices, physical books and e-readers)?** A majority of the technology-centered works focused on web technologies, presumably used in desktop and laptop computers. Different devices and platform offers distinct interaction possibilities and constraints. For example, on smartphones, tap-and-hold or consecutive tap gestures can provide on-demand definitions [96]; e-readers such as Kindle can monitor reading speed to trigger customized text adjustments [64]; and AR glasses can overlay simplified paraphrases directly onto printed book pages [111]. Future research should consider these other reading platforms and interactions.
- G **How may novel interfaces, including conversational interfaces and augmented/virtual reality, be leveraged and designed to provide reading support, and novel technologies such as generative AI and LLMs be used and evaluated as underlying engines to power these tools? How might the use of these technologies impact the social acceptability of reading support?** These novel forms of interaction may enable exciting possibilities to support readers in interfaces outside the web, but may also introduce new challenges that may require careful design and evaluation. For example, conversational interfaces may require prompting, which may require similar linguistic skills to those the reading support tools are intended to support. Further, as research has already begun exploring how novel technologies such as generative AI and LLMs can be used to provide reading support [222], exploring their use and evaluation to power reading support technologies will be important, especially considering their variable output. Lastly, the changing social norms and expectations around the use of conversational interfaces [35] and AI more broadly may impact the social acceptability of these tools.

Blind and Low Vision

- S **How can reading support technologies provide support with the linguistic readability of content for BLV readers, when using screen readers or braille? How should those be designed?** Most of the work on readers who are BLV has focused on supporting skimming and navigation in digital texts, or the development of literacy. However, even when texts are easy to navigate, they may still be complex to read. Thus, future research could exploring BLV readers' needs for reading complex texts and how those may be supported by reading support tools. However, most of the research we found providing support with content (e.g., through text simplification or visual augmentation) relied on visual means of portraying information, such as highlights to indicate complex text and overlaying interfaces to display simplifications. Thus, future research should explore the design space of non-visual content-oriented reading support.

Deaf and Hard-of-hearing

- S **How can scalable sign language based augmentation be designed and implemented to provide reading support for DHH readers?** Most of the publications focused on using sign language as reading support explored simple word-level support, or prerecorded videos which may be difficult to scale. Most of these studies also proposed specific designs without input from the users, but recent research on simplification with DHH readers has highlighted the importance of exploring the design of reading support technologies with DHH readers. Future research should thus explore how to incorporate more wholistic and scalable sign language technologies as reading support. Further, considering the rich design space of using video modalities to augment text as reading support [112], future research should carefully consider the preferences of DHH readers for the design space of using sign language to provide reading support.
- S **How may approaches specifically designed to increase readers' speed and focus benefit DHH readers'?** Considering the visual abilities of DHH readers [3], future research can explore how they may benefit from approaches that have been employed to support BLV readers in skimming and navigation (e.g., [4, 5]), or dyslexic readers with managing their visual fields [143]. Visual modifications that can make text more easily readable may also be interesting to explore.

Dyslexia

- S **How might content-focused interventions, or hybrid combinations of content and visual modifications, improve comprehension outcomes for readers with dyslexia?** The majority of existing research with dyslexic readers has focused on visual modifications to text—adjustments in font, spacing, color, and layout. While some formative studies have explored content-level interventions such as synonym suggestions, conceptual maps, or read-aloud features [120, 144, 165, 167, 172], these approaches remain underexplored. Tools may be designed to enhance comprehension by modifying not just the appearance but also the linguistic structure of the text.
- S **What design strategies for reading support tools best enable people with dyslexia to skim and navigate text more efficiently?** Prior research indicates that optimizing reading speed is crucial when designing support tools for people with dyslexia, who often experience slower reading rates [118]. While readability has received significant attention, our analysis suggests limited exploration of features specifically

designed to enhance skimming or text navigation for quicker information access, with masking techniques [183] being a notable exception.

Intellectual and Cognitive Disabilities

- S **How can research on reading support for individuals with intellectual and cognitive disabilities prioritize and build upon their existing strengths rather than solely addressing challenges?** A limitation in broader reading support tool research also evident in work with individuals with intellectual and cognitive disabilities, is its tendency to overlook unique challenges and strengths within these populations. Prior research highlights the importance of considering subpopulations, even within the same disability community (e.g., culturally Deaf vs. deaf [12]), as distinct groups possess strengths that necessitate tailored technologies [215]. Furthermore, the importance of agency and autonomy underscores the need for ability-based design, moving beyond a focus on deficits in people with intellectual and cognitive disabilities [194].

6 Limitations and Future Work

This review focused exclusively on HCI research, reflecting both our expertise and the disciplinary context of ASSETS. While this focus enabled a detailed analysis of research trends and the contributions of individual works, future studies could incorporate adjacent fields such as AI, NLP, and the social sciences—including disability studies and psychology—to provide a more interdisciplinary perspective. The AI community has published several reviews on foundational technologies relevant to reading support, such as text simplification [6]. Similarly, while we referenced psychological research, reading theories [176], and select works from disability studies [195], a more critical engagement with these fields to contextualize our findings was beyond the scope of this work. Future research could benefit from a more integrated analysis of HCI and non-HCI literature within a unified corpus.

We also limited our review to ACM publications due to their consistent indexing and metadata standards, which facilitated a systematic search within our inclusion criteria. However, we acknowledge that high-quality HCI work is also published in non-ACM venues, and future reviews could broaden the scope to include these contributions for a more comprehensive view of the field.

Our methodology did not incorporate quantitative techniques such as topic modeling or hierarchical clustering [121], which present promising directions for future investigation. Future work could also do more word- and language based analyses. For example, researchers could examine the nuances of disability-related language (e.g., person-first vs. identity-first), which warrants dedicated attention and analysis [185]. While our manual qualitative approach provided benefits including deeper and thorough engagement with the work, we also acknowledge limitations such as potentially missing relevant HCI papers. To address this limitation, we have included our full dataset containing the 101 papers we reviewed in the electronic appendix.

This review did not follow standardized reporting protocols such as PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [203] or the related QUOROM statement guidelines [51], which are commonly used in clinical and health-related disability research. Future multidisciplinary reviews may benefit from adopting these protocols, particularly when aiming to engage audiences in clinical, educational, or policy-oriented fields. Further, while reviews involving more than one coder may benefit from IRR for reliability, we did not compute it given that our codes were not interpretive [131]. Instead, we used our meetings to discuss and ensure agreement.

We chose to include all types of submissions, including posters and demos, given the relatively small and emerging nature of the research area. While we recognize that these submission types may differ in methodological rigor, they often contain early-stage ideas and prototypes that shape the trajectory of the field. As the body of research grows, future work might narrow its focus to specific publication types, such as full-length technical papers or demonstration systems.

Finally, only a small proportion of the publications in our dataset engaged with AI technologies (N = 17, 16.83 %), and none were solely based on state-of-the-art generative LLMs. In this respect, our review offers a snapshot of HCI reading support research preceding the expected rapid proliferation of generative AI-based technologies. As recent work in 2025 begins to explore the use of generative models in this space (e.g., [222]), future reviews should incorporate these developments to reflect the evolving design space and its implications for accessibility.

7 Conclusion

We present a systematic review of 101 HCI and accessibility publications ACM venues between 2000 and 2024 that focused on reading support technologies for people with disabilities. This review highlights the breadth of work in the field, with an emphasis on artifact development and short-term evaluation. Most research in this domain targets technologies for people with dyslexia, BLV, and DHH communities; we found limited exploration of other disability groups and a lack of participatory methods and longitudinal studies. Our findings suggest that future research should broaden community representation, more deeply incorporate co-design practices, and evaluate tools in real-world, sustained contexts. Additionally, as AI technologies like LLMs expand the design space for reading support, HCI researchers have an opportunity to investigate how these tools can be tailored to the diverse needs and preferences of disabled readers. We present several open questions for future researchers.

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