Information Research - Vol. 29 No. 2 (2024)

Developing expertise and managing inaccessibility: a study of reading by listening practices among students with blindness or vision impairment

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DOI: https://doi.org/10.47989/ir292522

Abstract

Introduction. This study aims to contribute to a better understanding of the learning that reading by listening requires from readers with print disabilities.

Method. Sixteen semi-structured interviews were conducted with university students with blindness or vision impairment in Australia.

Analysis. A theoretical reading of the interview material was conducted, with a basis in sociocultural learning theory.

Results. The responsibility for learning to use audio-based reading tools was often left to the participants themselves. The process of appropriating audio-based reading tools included two important aspects: digital literacy and learning to manage the sequentiality of audio text. This process was related to trajectories of participation in academic communities of practice, English-speaking communities of practice, and blindness and visual impairments communities of practice. It also included learning to participate in practices where vision and reading by seeing is the norm.

Conclusion. Three conclusions are drawn: 1) reading by listening is not a passive and effortless activity, it requires specific expertise, 2) socio-economic and socio-political circumstances influence how reading by listening is practiced and the learning that this form of reading requires, and 3) reading by listening requires learning how to navigate and manage the effects of institutions and systems that are disabling.

Introduction

The aim of this study is to contribute to a better understanding of the learning that reading by listening requires from readers with print disabilities. In this study, learning is understood through a sociocultural perspective as individual trajectories of participation in various communities of practice (Lave and Wenger, 1991). '*Reading by listening*' (Tattersall Wallin, 2021) refers to reading that involves the use of audio-based reading technologies such as screen readers, talking books, and audiobooks. The aim of the study is fulfilled through an analysis of interviews conducted with sixteen university students in Australia with blindness or vision impairment and who use audio-based technologies for reading. This group was chosen for this study because they have sufficient experience to discuss what one needs to learn in order to use these types of reading technologies independently. By focusing on university students, the scope of this study is limited to a discussion of reading by listening for the purposes of informational reading (see Lundh et al., 2018) or efferent reading (Rosenblatt, 1995) rather than reading for pleasure.

Previous research on reading by listening among people with print disabilities has largely focussed on whether the use of audio-based reading technologies constitutes reading (e.g., Hatlen and Spungin, 2008; see also Rubery, 2016), on technical aspects of audio-based reading technologies (e.g., Tånnander, et al., 2022), and institutional perspectives on how talking books are made accessible (e.g., Kaunda and Chizwina, 2019; Hamad, 2023). There are few recent studies centred on the learning and everyday practices of actual readers with print disabilities (Olsson Dahlquist and Wennås Brante, 2024). This study is a user study conducted in the context of critical studies of reading (Lundh, et al., 2022), a research tradition wherein reading activities are studied as part of socially and institutionally situated practices. The purpose of such studies is to explore and understand reading activities and practices as they take place without assessing or evaluating the reader. In this study, this means taking an interest in how the students describe what they need to be good at when using audio-based reading technologies for their studies, and the prerequisites for their use of these technologies. Furthermore, this study draws upon sociocultural theory of learning (Lave and Wenger, 1991) to analyse the *interplay* between the individual students, the reading technologies employed, and the social and institutional practices in which reading by listening takes place, rather than focusing on any of these aspects discretely.

This study builds upon two basic premises. The first is that the use of audio-based reading technologies can be regarded and studied as a type of reading practice that requires specific learning. This learning has rarely been described in previous research (Olsson Dahlquist and Wennås Brante, 2024). The second premise is based on the so called '*social model of disability*' (Oliver, 2013), which highlights how disablement occurs when social environments are not constructed for people with impairments. This perspective means that the focus is not on the interview participants' impairments as such, but rather on how social and institutional practices function as inclusive or disabling in relation to reading (see Lundh, 2022). In the context of Australian universities, previous studies have shown that students with print disabilities face a number of disabling practices despite having the legal right to access learning materials in formats that they can read. For example, in 2011, Harpur and Loudoun described issues that these students have with getting access to course literature in time. That this issue still occurred in 2020 has been described in a survey report by Mrva-Montoya. Furthermore, in 2021 Cain and Fanshawe highlighted accessibility issues with online tools used at Australian universities such as learning management systems.

Literature review

Empirical studies regarding the use of audio-based technologies for reading as part of day-to-day life of people with blindness or vision impairment do not constitute a coherent research area (Lundh, 2017; Lundh and Johnson, 2015; Olsson Dahlquist and Wennås Brante, 2024)). Instead, studies have originated from various fields of research during different

periods of time. The following section provides an account of these studies.

A historical perspective of the evolution and reception of the talking book and the audiobook, especially in the United States and the United Kingdom during the 20th century, is provided by Rubery (2016). Another historical piece of research focusing on the context of the United States is a study by Mills and Sterne (2020). They coined the concept '*aural speed-reading*' to describe the type of reading that was enabled by the technical developments that made increased audio-speed possible and improved the navigation of recorded books during the 1900s. Mills and Sterne (2020) also point to the entanglement of these developments with the changing demands of literacy in a modern, industrialised world.

A pioneering example of research focussing on time-compressed speech was led by experimental psychologist Foulke in the 1960s and 1970s, again in the United States (e.g., Foulke, 1967; Foulke and Sticht, 1966; Lass, et al., 1974; see also Rieser, et al., 1999). These studies highlighted how technological developments enabled people with blindness or vision impairment to listen to reading materials at higher rates of speed while maintaining recording quality, and how reading by listening is something people can become better at with training.

Hyder's (2013) ethnographic study of public library reading groups for people with blindness or vision impairment in the United Kingdom sheds light on how the '*privileging of the printed word*' (2013, p. 46) creates a '*psycho-emotional disablism*' (2013, p. 38), and a range of practical barriers for the participants' reading activities. The study also illustrates how reading groups facilitate the exchange of experiences regarding the use of technologies for reading.

Several studies published during the past three decades have focused on format preferences and technology choices of people with blindness or vision impairment and emphasise that they typically use more than one tool for reading. D'Andrea's (2012) study of twelve high-school and college students in the United States with blindness or vision impairment showed that the students used a variety of tools – including audio-based tools – to read and write for school. The students' preferences varied; different individuals had their own specialised '*reading and writing tool-box*' (see also Spooner, 2014) from which they choose tools depending on the task at hand. Students also reported that they learned to use several of these tools outside of school. In a Norwegian context, Vik and Lassen (2010) illustrated how access to various reading media in school is not sufficient for pupils to become good readers; the school environment, the quality of instruction, and both personal and social resources all play a crucial role for pupils' academic success. Furthermore, Hesketh (1999), Spooner (2014), and Singleton and Neuber (2020) emphasised the importance of instruction in the use of audio-based technologies for reading, especially as new types of these technologies continually emerge.

In a Greek context, Argyropoulos et al. (2019) note that while primary and secondary school students with blindness or vision impairment consider audio to be the most effective mode of text for their schoolwork, students preferred to use other modes (e.g., braille, large print). Argyropoulos et al. (2019) speculated whether this was due to socio-political factors in Greece, where assistive technologies are difficult to obtain, and school children are not systematically taught how to use them. A similar situation where the provision of accessible formats does not meet user demand was described in a Nigerian context by Adetoro (2012), and in a New Zealand context by Spooner (2014). Furthermore, a number of studies from the past decade (Harpur and Suzor, 2014; Oswal, 2014; Mulliken and Falloon, 2019; Xie et al., 2023) investigate accessibility issues experienced by screen reader users in systems and documents provided by academic libraries.

In conclusion, while studies on the use of audio-based technologies by people with blindness or vision impairment is not a cohesive area of research, several studies from various fields take an interest in the types of tools that people use for reading and writing, especially in educational and leisure settings,

and highlight the importance of socio-political and institutional circumstances surrounding the use of audio-based technologies for reading. This study builds on this interest in day-to-day use in relation to social and institutional circumstances. In addition, it takes an interest in the learning that this use requires of participants.

Theoretical framework

In order to contribute to a better understanding of the learning that reading by listening requires from readers with print disabilities, the analysis of the participants' accounts is guided by concepts stemming from the influential works of sociocultural theorists Lave and Wenger (1991; see also Lindberg, 2015; Moring, 2011). This theoretical framework emphasises learning as a continuous process which is fundamentally social. Thus, it enables an analysis of reading by listening that does not solely focus on the individuals, the reading technologies, or the social and institutional settings in which this reading takes place, but the interplay among these.

In particular, several interrelated concepts serve as a basis for the analysis. According to Lave and Wenger (1991; see also Moring, 2011), learning is best understood and analysed in terms of individual *trajectories of participation* in various *communities of practice* through which people develop and negotiate *identities* and where *access* to tools and artefacts central to the activities of the communities of practice is an important part. Similarly, related sociocultural theory (e.g., Wertsch, 1998; see also Lindberg, 2015; Sundin and Johannisson, 2005) illustrates how learning includes the *appropriation* of tools and artefacts, where the competent use of these tools and artefacts become part of one's identity.

According to Lawthom (2012), who argues for the usefulness of the concept in disability studies, a community of practice is '*a collection of people bound together by location, purpose, activity, values, desires or, perhaps, labels*' (p. 235). Lave and Wenger (1991) argue that learning is an inherently social process where novices, such as first year students, can move from '*legitimate peripheral participation*' (p. 29) to '*full participation*' (p. 37) in a community of practice. Full participation means that one is considered to be a competent member of a community of practice, for example, as a university student who completes an advanced degree.

Furthermore, as highlighted by Moring (2011), individuals have different trajectories of participation, as they move in and between different communities of practice. For example, Lawthom (2012) exemplifies how impairments can create exclusion from certain communities of practice (such as university studies), but also create inclusion in others (such as disability organisations) and how inclusion in the latter can help negotiate and influence inclusion in the former.

For the present study, it is also important to note that communities of practice can be exclusionary and that gaining access to a community of practice can involve negotiation and power struggles. While community of practice might sound like a concept implying harmonious relationships where existing participants always welcome new members, Lave and Wenger (1991) highlight that participation is reliant on access:

> *To become a full member of a community of practice requires access to a wide range of ongoing activity, old-timers, and other members of the community; and to information, resources, and opportunities for participation. The issue is so central to membership in communities of practice that, in a sense, all that we have said so far is about access.* (*Lave and Wenger, 1991, pp.100-101*).

For students with blindness or vision impairment, gaining access to '*information, resources, and opportunities for participation*', can, for example, be about the timely provision of reading materials in accessible formats, as well accessible university buildings, learning management systems, lecture materials etc. Moreover, if the students are not getting such access, the institutional practices of the university are (as illustrated by the social model of disability described in the introduction) disabling.

Furthermore, the individual students' trajectories of participation include changes and negotiations of *identity*, as '*learning… implies becoming a full participant, a member, a kind of person*' (Lave and Wenger, 1991, p. 53). As Lawthome (2012, p. 54) notes, for people with impairments, this negotiation of identities might include whether one can be regarded, by oneself and/or by others, as a person who is disabled, not least in relation to communities of practices organised around notions of disability.

Lastly, sociocultural theory of learning emphasises the material aspects of learning, and how learning in any community of practice involves the appropriation of cultural tools. Wertsch (1998, p. 54) describes the process of appropriation as a process '*of taking something that belongs to others and making it one's own*'. Specifically, Wertsch (1998) refers to cultural tools, where language is seen as the primary cultural tool, and making them one's own by using them in practice. In this study, learning to read by listening is seen as a process that involves the appropriation of the tools (the talking books, screen readers, audiobooks, etc.) that make reading by listening possible.

Thus, the theoretical foundation of this study underlines how learning is tied to social and institutional practices. Furthermore, such practices can create inclusion or be disabling for people with impairments. The following section describes how this theoretical foundation is operationalised in the analysis of the empirical material.

Method

In order to fulfil the purpose of the study, qualitative interviews were conducted with sixteen participants. The study was carefully designed in relation to the specific circumstances of the user group in focus, which will be described in detail below.

The participants were persons with blindness or vision impairment that were or had recently been studying at an Australian university, and were users of audio-based reading technologies. The participant group was heterogeneous in terms of sex, age, country of birth, linguistic background, subjects/programmes studied, and type of vision loss and type of audio-based technologies for reading used. This heterogeneity created rich and varied responses to the interview questions. To protect participant confidentiality, personal information cannot be reported in detail.

Participants were recruited according to a purposive sampling strategy, which included volunteer and snowballing sampling methods, from September 2018 to June 2019. An electronic recruitment flyer was distributed through the author's and a research assistant's networks in blindness and vision impairment communities, through Australian universities, and via already recruited participants. The author also sought participants through a radio programme produced for people with blindness or vision impairment.

The semi-structured interviews were conducted by the author and were approximately one hour in length. To minimise effort for the participants, for whom travelling can be challenging and who are at risk of experiencing research fatigue (see Banas, et al., 2019), the interviews were conducted via phone or (video) telephony programs. In all interviews, participants were asked to describe their background; their current or most recent university studies; their use of audio-based technologies for reading; when, where, how, and with what type of support they had learnt to read by listening; and the skills and abilities needed to read by listening. All participants received a $50 (Australian dollars) supermarket gift card after the interview, as a small compensation for their time and effort. The interviews were transcribed in their entirety and approved by each participant. The study was reviewed and approved by the Curtin University Human Research Ethics Committee. Before recruitment commenced, the author participated in disability awareness training that focussed on research participants with blindness or vision impairment. This included a pilot interview with a person who is blind and who provided feedback on the interview guide. Furthermore, all materials distributed to participants (including consent forms) were designed according to accessibility principles

and were also read aloud to participants who so wished.

The analysis of the interview material consisted of a '*theoretical reading*' where the theoretical concepts are employed to guide, but not steer, the analysis (Brinkmann and Kvale, 2015, p. 269-275). A theoretical reading is not a standardised technique, but involves reading and rereading the interview transcripts, and, in this case, moving the analytical gaze back and forth between the individual interviews, all of the interviews seen as a whole, and the theoretical framework. First, the material was read and coded according to a bottom-up coding process resulting in forty-six codes (e.g., '*Type of technology for a particular type of reading/purpose*'; '*Preference: format/technology*'; '*Information searching*'; '*Discrimination/ unhelpfulness/ ignorance*'; '*Learning on their own*'; '*Helpfulness/things that work well*'; '*Blind/vision-impaired early/later*'; '*High speed listening*'; '*Costs/market/*NDIS'; '*University meant new tools*'). The codes were then aggregated into four interrelated themes influenced by the theoretical framework, focusing on 1) the individual trajectories of participation; 2) appropriation of audio-based reading tools; 3) various communities of practice of importance for reading by listening; and 4) disabling practices in relation to reading by listening. A third step in this iterative process involved the writing of a summary of each interview in relation to the four themes. This served as a verifying step, wherein the summaries were read both as individual cases and as part of a whole. The four themes are presented in the analysis section and each is exemplified with interview excerpts, with the exception of the sub-section '*Participation in blindness and visual impairments communities of practice*' where no excerpts are included to protect participant confidentiality.

Results and analysis

The following four sections present the analysis of the interviews, each section covering one of the four themes.

Individual learning trajectories with various levels of support

The first theme concerns the participants' different learning trajectories in terms of reading by listening. While some participants had used audio-based tools for reading since they learnt to read as children, others had learnt to use them later in life. In some cases, the latter was because vision loss had occurred in the participants' adult lives, and sometimes because audio-based tools for reading had not been available to them when the participants were younger. Thus, the participants can be described as ranging from novices to experienced audio readers. They also discussed how certain technologies and modes of reading (reading by using audio, braille, or large print) were useful for different types of reading, for different purposes, and in different settings. Each participant mentioned at least two modes of reading and they described their strategies in terms of choosing the most useful mode of reading for different tasks (see Lundh, 2022).

Each participant described a different experience with starting to read by listening, and they each had a personal trajectory of learning to use audio tools for this purpose. However, a common theme across all interviews was stories of how participants had learnt how to use audio-based tools for reading effectively on their own, perhaps after some basic instruction through formal education or services and organisations for people with blindness or vision impairment, and through informal channels, such as through friends or online groups. For example, Participant C described how they learnt to use JAWS (a screen reader) by downloading tutorials from the manufacturer and being shown software fundamentals through support at a vocational institution they attended at the time, and how this changed their perception of what they could do in terms of further studies:

> ***Participant C:*** *up until that point thought that I wasn't a very good student. I didn't have much hope for continuing study. I was planning on doing something basic that would enable me to get a job… I don't know. But basically, learning how to use the audio technologies it turned my life around and*

gave me opportunities that I didn't have before.

Interviewer: *Yeah. And where did that idea come from… to start using* JAWS?

Participant C: *Probably from other blind people I was meeting. Because around that age I started going to* [an organization for people with blindness or vision impairment] *meetings and things, and I guess see what they could do, and understand how it was done. You know peer pressure is the sort of best teacher for that sort of thing.*

There were exceptions to stories like these, but overall, there were few accounts of systematic training in how to use audio-based reading technologies. Furthermore, participants who were audio readers from a young age and had received specific blindness or low-vision reading instruction in school also described learning to use audio-based reading tools as something they did on their own. For example, Participant E described that:

Interviewer: *so you started off with cassettes and then you went sort of gradually into screen readers. Have you gotten any support in learning how to use both cassettes and screen readers?*

Participant E: *I think I just pretty much taught myself. … I don't really remember being taught how, not formally taught how to use this stuff. I used to use Window-Eyes* [a screen reader], *recently last year I swapped over to* JAWS. *But really a lot of it I think I taught myself. I purchased a how to use Window-Eyes, Microsoft 2013 training package, an online training package, and just kind of read through that and taught myself a lot of things.*

Thus, in the interviews, while learning to read by listening was supported to some extent from various institutions, it also happened outside educational institutions. While learning to read by listening could be life-changing, the responsibility for this learning was often left to the participants themselves.

Appropriation of audio-based tools for reading

The participants also described reading by listening as something that one can be good or less good at. While some of them described this type of reading as a struggle to them as novices, others, more experienced users described how this type of reading was something that was automated. Regardless of experience and level of expertise, the participants were able to describe two important aspects in the process of appropriating audio-based reading tools, namely 1) digital literacy, and 2) learning to manage the sequentiality of audio text.

Digital literacy

One aspect of the appropriation of audio-based reading tools concerns the handling of hardware and software in relation to reading by listening. While some participants mentioned that they started off their trajectories as listening readers using cassettes, their current reading by listening activities were characterised by the use of digital technologies. Consequently, reading by listening required knowledge and experience in using digital technologies. For example, Participant D mentioned that knowing how to use computers was helpful when they learnt how to use a screen reader:

Participant D: *I think it's sort of lucky that before that I was a competent computer user, so I think I picked it up pretty quickly.*

A few participants highlighted that reading by listening requires an understanding of how digital text is structured, as well as how the software and hardware one uses to read digital text have been designed. An example of this is Participant F who described that reading by listening required thinking like a programmer:

Participant F: *because when you read using like an audio-based technology, particularly with* JAWS, *you have to sort of think in a programmer's mind-set.*

Hence, an overall understanding of digital technology was described as an important part of being an audio reader. A specific aspect of knowledge in relation to digital technologies mentioned by several participants was learning

and remembering commands or shortcuts, that is, combinations of keystrokes controlling the functions of a specific screen reader. For example, Participant B emphasised the importance of knowing commands:

> ***Participant B:*** *Like, I wouldn't consider myself a really skilled user, but…*
>
> ***Interviewer:*** *No?*
>
> ***Participant B:*** *No. I mean, I'm better than the average user…*
>
> ***Interviewer:*** *Yeah.*
>
> ***Participant B:*** *but I wouldn't consider myself an expert. Like, an expert is someone who knows all the commands… I can't remember all the commands, there's so many, you know, there's hundreds and hundreds of them and when do you use them all?*

Another example is Participant Q, who highlighted that different screen readers have different sets of commands, and how changing from JAWS to VoiceOver meant that they had to retrain themselves:

> ***Participant Q:*** *So just adjusting took me a bit of time cause I would be trying to use JAWS shortcut keys or whatever on the VoiceOver program and it would not work. So learning a new system was an adjustment but yeah I got there.*

Thus, understanding and being able to handle various aspects of the digital technologies used for reading by listening was described as an important part of the appropriation of audio-based reading technologies. This kind of proficiency may be regarded as a particular type of digital literacy (see Bawden, 2001).

Learning to manage the sequentiality of audio text

Another aspect of the appropriation of audio-based reading technologies concerned learning to manage the sequentiality of audio text. When reading for example through using a screen reader or a talking book, the reader has to read sequentially; skim reading or scanning in the sense of just reading pertinent parts of a text is impossible. Reading by listening therefore required significant time and effort on the part of participants. For example, Participant P explained:

> ***Participant P:*** *But when you're text-to-speeching, you've got to kind of read through, you can't just skim, you've got to read through pretty much everything so it's really time consuming.*

This was particularly the case for novice audio readers who were still adjusting to reading by listening. More experienced audio readers described how they had increased their reading speed considerably since they began using audio. For example, Participant J mentioned that their listening rate is incomprehensible for someone who is not used to reading by listening:

> ***Interviewer:*** *And do you think that it requires certain skills to read using your ears?*
>
> ***Participant J:*** *Um… I don't know. If I try to give it to my friend to listen to the book, like I do, then they say 'I won't be able to do that.'*
>
> ***Interviewer:*** *No? Why would they say that?*
>
> ***Participant J:*** *The first saying is that it's just very fast for them.*

Learning to listen at a high speed was an important aspect of reading by listening for the participants, particularly as university studies require students to read large amounts of text within tight time constraints. Several participants mentioned that they preferred audio when they wanted to read quickly and get an overview of a text, and therefore preferred synthesised speech to recorded speech (something novice users were still adjusting to) because the speed could be increased. However, while speed reading was possible using audio, reading by listening still took more time than reading does for students without print disabilities. Thus, reading by listening required not just the ability to increase the speed of synthesised speech, but also finding ways to manage time and become more efficient when reading for the purpose of studying.

The non-optional sequentiality of audio text also placed high demands on the participants' concentration. For example, Participant Q explained this was due to the difficulty of stopping and rewinding audio technologies to re-read a specific passage:

> ***Interviewer:*** *And do you think it requires certain skills to read by listening?*
>
> ***Participant Q:*** *Yes. Yeah. You have to kind of pay more attention I guess.*
>
> ***Interviewer:*** *Yeah, to what?*
>
> ***Participant Q:*** *Just what they are saying, and then you've sort of got to memorise it because especially when you are listening to audiobooks, it's a lot more difficult to kind of just go back to sentence by sentence or page by page than someone reading it visually. So you've kind of just got to absorb what they are saying as they are saying it.*
>
> ***Interviewer:*** *So you need to stay more focused in your reading when you are listening?*
>
> ***Participant Q:*** *Yep.*

Thus, in order to comprehend what was being read, the participants needed high levels of concentration. Participant E explained it in terms of having '*auditory skills*':

> ***Participant E:*** *I have friends who can read and take things in with screen readers so quickly that I can't even understand them. And I think that's probably because that's how they've done things throughout ... like my friend... Their screen reader is so fast, I can't understand it, they got to slow it down if they want me to actually hear. So I absolutely think there is skill involved, because you've got to process, you've got to get the auditory, the stuff you are getting audibly I guess, the auditory skills, you've got to get that information from hearing to brain. And you've got to somehow... oh how do I...? When you read it in audio, often I do anyway... you've got to read it line by line. Whereas if I'm reading something in braille, it is more ongoing, because you don't notice the lines. You've got to... oh... I don't even know how to describe it Anna, it's getting that information that you might be getting in a disjointed way, to flow.*

What Participant E describes is that because audio reading requires reading sequentially, learning how to read by listening with '*flow*' and comprehend what is being read takes time and effort, as does learning how to concentrate on high-speed audio text. Thus, in addition to being a time-consuming process, both novice and experienced audio readers also described reading by listening as a tiring process.

Learning at the intersection of different communities of practice

The participants' stories also illustrated how reading by listening takes place in and across overlapping communities of practice. Three intertwined types of communities of practice can be identified in the interviews: academic communities of practice, English-speaking academic communities of practice, and blindness and visual impairments communities of practice.

Participation in academic communities of practice

Given that the participants were interviewed about their reading by listening in relation to their roles as university students, their participation in academic communities of practice was a focus in the interviews. In particular, academic reading and information seeking activities were discussed. For some participants, learning to read by listening coincided with commencing university studies in an area they had not studied before. This meant they needed to familiarise themselves with a specific academic discipline and become accustomed to a new method of reading concurrently. For example, while describing how they had spent part of their day painstakingly reading an advanced text on a specific subject using synthesised text-to-speech, Participant A stated:

> ***Participant A:*** *The conceptual stuff is difficult and the delivery method is difficult...*

Thus, while technical skills and know-how were helpful to the participants in terms of their reading by listening, their understanding of the

specific contents was fundamental. This is also illustrated by Participant H, who described how it was possible to listen to a text without fully grasping what it was about:

> ***Participant H:*** *That's the thing too, if Dragon* [a speech-recognition software that includes text-to-speech] *won't of course tell you how to understand stuff, it will just basically tell you what's being said. You still need to add on to the fact that do you even understand the context, do you understand the meaning behind it.*

Both Participant A and Participant H were quite new to using audio-based technologies for reading and described how this method of reading could amplify the difficulties they experienced in their reading as university students. This was sometimes also the case for participants who were more experienced in reading by listening, especially when the resources they used for their studies, such as databases, library catalogues, journal papers, and books, had accessibility issues. For example, while talking about how they went about information seeking for writing their thesis, Participant B described the extra time it took when a potentially useful source was not screen reader accessible:

> ***Participant B:*** *I used a screen reader and when I had sources that were image based, which some of those things are, so they are PDFs, but there's no text in there, then I had to send it through things to make it into text and that is always very frustrating.*

The participants described how their information seeking as university students was characterised by uncertainty, as do many students (see e.g., Kuhlthau, 2004). However, using text-to-speech technologies while doing database searches added to this uncertainty as the participants could not be sure that the databases they used and the documents they retrieved would be readily accessible to them. Thus, for these students, the use of audio-based technologies for reading meant that they had to deal with an additional layer of complexity to the already complex task of finding and reading literature of their respective fields of study.

Participation in English-speaking communities of practice

While all participants studied at Australian universities and thus had conducted or were conducting their studies in English, this fact mattered especially to participants whose native language was not English and who had not completed either their schooling and/or previous university studies in an English-speaking environment. For multilingual students, the language of the text they read could decide which audio-reading tool they preferred and used; sometimes their preferred screen reader for texts in English was not available in their other languages, which meant that they had to switch tools and devices depending on what language they wanted to read in. For example, Participant N described how they used one type of screen reader to read private correspondence in their native language and a different type of screen reader for their studies in English. This meant that they had to restart their computer when alternating between the two:

> ***Participant N:*** *But the thing is sometimes it takes time because I need to restart my computer and move to… Windows. And then, then after I listen to my e-mails or my stuff, articles, and so I restart again back to VoiceOver.*
>
> ***Interviewer:*** *Oh! Okay so you need to restart your computer when you want to swap screen readers?*
>
> ***Participant N:*** *Yes. Yes.*

Thus, multilingual participants had developed their individual *reading toolboxes* (see D'Andrea, 2012; Spooner, 2014) in relation to the different languages that they read.

Another aspect of reading by listening in English was that it could be helpful to read English texts by listening, as opposed to reading by seeing or reading by touch (see Tattersall Wallin, 2021), as a way of learning English as an additional language better. This was mentioned by Participant K:

> ***Participant K:*** *I think I can improve a lot because English is not my mother language, it is second language, but when I used to read*

books by listening, I get lots of knowledge and familiar with pronunciation, and the contents. And now I feel like more comfortable to communicate with others or when we discuss or something like that.

Interviewer: *So for you it's been also a matter of learning English better? So therefore it's also useful to listen as well?*

Participant K: *Yes.*

Furthermore, for some participants, such as Participant K, the use of audio-based technologies changed when they moved to Australia and had the opportunity to access tools they could not access in their home countries for various reasons, such as financial costs. This highlights how reading by listening practices are intertwined with access to various communities of practice, such as English-speaking academic practices, but also blindness and visual impairments communities of practices more broadly.

Participation in blindness and visual impairments communities of practice

The participants also participated in blindness and visual impairments communities of practice. This involvement included the participants' negotiations of their identities as persons with blindness or vision impairment (see e.g., Zapata, 2018), as well as their access to these communities (see Lawthome, 2012). Furthermore, being part of such communities was related to access to technologies for reading.

While some of the participants had learnt to read as children with blindness or visual impairment, others had had to learn new methods of reading because of vision loss in adolescence or adulthood. Some participants had taken up university studies as their vision loss meant that they had to make changes in the careers. Some of the participants therefore had to manage several new identities and trajectories of learning at the same time, for example as students in a new field of study, as students in an English-speaking country, *and* as persons with blindness or vision impairment, learning new ways to relating to the world, including learning new methods of reading. Other participants started their university studies with a longer trajectory of participation in blindness and visual impairments communities of practice, which also included already well-developed *reading toolboxes* (see D'Andrea, 2012; Spooner, 2014).

During the interviews, the participants mentioned using a range of devices for reading by listening and types of software for this. They described how access to such technologies could be necessary and even life-changing. However, access to useful technologies for reading by listening varied between participants, and changed over the course of the participants' lives. While no questions about the participants' socio-economic status were asked during the interviews, the cost of audio-based technologies for reading was brought up by the participants. Some participants mentioned they would like to use other audio-based technologies for reading that were different from what they currently used, but that the cost of these was prohibitive.

Thus, just as participants' access to systematic training in using audio-based reading technologies varied, their ability to purchase or obtain access to the tools they needed for reading differed. This depended on aspects such as whether participants had access to the Australian National Disability Insurance Scheme (NDIS), had secured scholarships, or were able to access reading technologies through their universities or employers. Getting such support could sometimes require certain types of knowledge, not least in terms of one's needs and rights as a person with blindness or vision impairment. This type of knowledge seemed, to some extent, to relate to the participants' involvement in blindness and visual impairments communities of practice. Through such participation, the participants could learn what kind of tools, artefacts, and supports were available and how to get access to these.

Learning how to navigate disabling and inaccessible practices

There were also hindrances to the participants' trajectories of participation in academic communities of practice and their reading by

listening. Part of the participants' learning related to reading by listening included learning how to navigate academic practices where vision and reading by seeing is the norm. This becomes especially clear in the participants' descriptions of accessibility issues in different kinds of information systems they needed to use for their studies, such as learning management systems or catalogues and databases provided by the university libraries, as well as in certain types of document formats they encountered.

While many of the participants mentioned that they had good experiences in terms of getting support from their universities when needing reading materials in accessible formats, the very fact they needed to have materials converted from one format to another format highlights how reading by seeing is the norm. Furthermore, some participants described how they had encountered university staff who did not understand their needs as students with blindness or vision impairment. This meant that they did not get the support or adaptations they needed and were entitled to.

The effects of the continuous extra effort of having to manage inaccessibility and disabling practices often had a negative impact on the students. For example, when discussing how accessibility is treated as an add-on, rather than as a given, and that therefore their studies required constant self-advocacy, Participant D mentions that:

> ***Participant D:*** *Unfortunately, you are always sort of playing catch-up.*

Furthermore, a consequence of needing help with activities such as converting files or navigating inaccessible databases means that students with blindness or vision impairment have to invest extra time and energy to access reading materials, compared to students who read by seeing. Also, as these extra activities take time and, as mentioned above, reading by listening in itself generally takes more time than reading by seeing, these students need to expend additional effort in planning their study.

In addition, having to ask for help from disability services, the university library, lecturers, peers, or family and friends, means losing some of one's independence as a student. For example, Participant N gave an example of when they studied at night and had to give up independent information seeking, as support services were not available at night:

> ***Participant N:*** *But the other side is that sometimes like at night, at night when I'm doing my assignment and I want to find out some article. But at that time I cannot make appointment with anyone at that time, like around 9, or 10 or 11pm. No one working. So I have to say that at that time the website is not really accessible. So I have to stop my studying… which I find challenging.*
>
> ***Interviewer:*** *Yes you can't just…*
>
> ***Participant N:*** *You understand what I'm saying right?*
>
> ***Interviewer:*** *I am. You are saying that you can't just check something up when you feel like it, you need to be quite organised around it all?*
>
> ***Participant N:*** *Yeah, yeah, yeah.*

Another aspect of having to ask for help and thus losing independence is the psychological effort asking for help can require. For example, Participant O mentions that they did not ask for additional help from disability services when an assignment required independent information seeking, even if they were entitled to that kind of support, as:

> ***Participant O:*** *I don't want to be seen as being a problem.*

Thus, that reading by listening is a non-normative mode of reading has a real impact on the participants and the ways in which they conduct and experience their university studies.

Discussion and conclusions

The aim of this study was to contribute to a better understanding of the learning that reading by listening requires from readers with print disabilities. Through an analysis based in sociocultural theory of learning of interviews with students with blindness or vision

impairment and who are users of audio-based reading technologies, it is possible to identify and discuss skills and abilities for reading by listening, as well as the social and institutional practices these students identified as important for their reading by listening activities.

The first conclusion that can be drawn from the study is that reading by listening is not a passive and effortless activity, but an activity that requires specific expertise. Two aspects of the appropriation of the tools used for reading be listening can be identified, namely: being digitally literate and learning to manage the sequentiality of audio text. Thus, the study illustrates contemporary '*aural speed-reading*' (Mills and Sterne, 2020), an activity that requires certain skills and abilities and which is influenced by technological developments, as well as the high demands placed on students' reading.

Furthermore, the study illustrates that one indeed can become a better audio reader through training (see Lass et al., 1974). However, while the importance of systematic training in the use of audio-based technologies for reading has been highlighted in previous research (e.g., Hesketh 1999; Singleton and Neuber, 2020; Spooner, 2014) this study illustrates that many of the participants had to learn to use these technologies on their own or with support from peers, rather than through formal training and support. An important task for universities is therefore to provide support, systematic training and specialised help desks for students who read by listening. In such efforts, it would also be important to take into account that these students have individual *reading toolboxes* (see D'Andrea, 2012; Spooner, 2014), and that their reading by listening expertise can range from beginner level to highly experienced.

The study also illustrates that reading by listening is not only about individual skill and ability, but is also something that is formed in relation to social and institutional practices. The participants' reading by listening is related to their trajectories of participation in academic communities of practice, specific linguistic communities of practice, and the blindness and visual impairments communities of practice. In other words, the participants' appropriation of the tools and artefacts involved in reading by listening was interrelated with their level of expertise as students, as English speakers, and also their relationships to their identities as people with blindness or vision impairment and their access to blindness and visual impairments communities of practice. Trajectories of participation in academic, English-speaking, and blindness and visual impairments communities of practice were significant for accessing the tools and artefacts participants needed for reading by listening. As such tools and artefacts are not always mainstream, getting access to such tools and artefacts could be a challenge. For various reasons, participants did not always have the necessary knowledge or the financial capacity to obtain the reading tools and artefacts they needed. Thus, the second conclusion that can be drawn from the study is that socio-economic and socio-political circumstances (see also Adetoro 2012; Argyropoulos, et al., 2019; Spooner, 2014) influence how reading by listening is practiced, and the learning that this form of reading requires.

Furthermore, the study illustrates that the students' reading by listening activities takes place in relation to communities of practice where reading by listening is not the norm. The participants' accounts revealed issues of exclusion, inaccessibility, and disablement and the impact of this on them as individuals. The third conclusion that can be drawn from this study is therefore that reading by listening requires learning how to constantly navigate and manage the effects of institutions and systems that are disabling. An important activity for the university sector would therefore be to continuously educate and support all university staff, including university lecturers, university librarians, and IT support, about how to make university practices inclusive for students with print disabilities, making diversity in terms of methods of reading the norm, and thereby actively work against current disabling practices.

Further research

As a piece of explorative and small-scale qualitative research, the study can serve as a

foundation for further studies on the learning that reading by listening requires from people with print disabilities. For example, as social and institutional practices, as well as socio-economic and socio-political circumstances influence reading by listening, studies of various aspects of the types of skills and abilities reading by listening requires in various settings and national contexts would be valuable. Ethnographic studies of the use of audio-based technologies for reading by people with different types of print disabilities as it takes place in natural settings would also shed further light on both the expertise of these readers, as well as the disabling practices they are facing.

Acknowledgements

This study was funded by the Curtin Research Fellowship, Curtin University, Perth, Australia. The author would like to thank the study participants for their time and willingness to describe their reading practices in the interviews. She would also like to thank Karl-Fredrik Ahlmark, Mats Dolatkhah, Åse Hedemark, Scott Hollier, Linnéa Lindsköld, Lisa Olsson Dahlquist, Nasrine Olson, and Elisa Tattersall Wallin for their valuable input during the preparations for and the writing of this paper, as well as Christine Yates for her excellent help with the transcriptions of the interviews and both Christine Yates and Merisa Martinez for the English editing of the manuscript.

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