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Understanding the Needs and Constraints of Speech-Language Pathologists When Using Technological Devices in Rehabilitating People With Aphasia

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ABSTRACT

Background: Aphasia is a language disorder caused by brain injuries or neurodegeneration. It has been recognized as having one of the most substantial negative impacts on patients' quality of life, with its impact exceeding that associated with several major health conditions, including cancer and Alzheimer's disease (Lam & Wodchis, 2010). Given its significant impact on communication and daily life, aphasia rehabilitation requires intensive interventions aimed at improving functional communication. This care is promoted by Speech Language Pathologists (SLP). They use multiple techniques and approaches, including structured exercises, ecological simulations or devices (Oussama et al., 2021). Numerous applications are available to support SLP in their evaluation, in the functional treatment and in augmentative and alternative communication (AAC) to encourage patients to use any type of communication (van de Sandt-Koenderman, 2011). Despite the growing availability of these technological solutions, they do not always fully meet the needs of SLPs or take into account the specific constraints experienced by People with Aphasia (PWA). To get a better understanding of SLP's needs and constraints regarding these technologies, a user-centered approach has been put in place. This approach will provide a set of requirements that should allow the development of more usable devices (Yardley et al., 2015).
Method: Eight French-speaking SLP women volunteers participated in the study. They provide care in public and private hospitals and as independent. Each participant took part in a one-hour semi-structured remote interview. The questions focus on their clinical management and the personalization of the rehabilitation according to PWA's individual needs.
Results: SLPs highlighted the necessity to adapt both rehabilitation and technological tools to each PWA' individual characteristics. They also reported that some devices were poorly aligned with clinical practice, with limited SLP involvement in their development. Finally, varying exercises and aligning goals with PWA's functional communication abilities were seen as important to maintaining motivation.
Discussion: The interviews provided insights into the determinants of the personalization of rehabilitation provided by SLP. Technological devices were mainly used to monitor the progress of PWA, providing varied therapeutic support and promoting rehabilitation at home, potentially contributing to improving the quality of life (Güngör Ketenci et al., 2026).

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Keywords: Aphasia, Rehabilitation, User-Centered Design (UCD), Need analysis, Speech-Language Pathologist (SLP)

INTRODUCTION

Aphasia is known as a communication disability by the International Classification of Functioning, Disability and Health (ICF) developed by the World Health Organization (WHO). It is a language disorder occurring after brain injury or neurodegeneration (Dubuc & Guenin, 2024). Strokes are the main cause of aphasia in the adult population (Sinanović et al., 2011). The other causes of aphasia are head injuries or brain affections and neurodegenerative pathologies, like the primary progressive aphasia. In 2023, 844 500 people were treated for stroke sequelae in France and it is estimated that 21% of this population is living with a post-stroke aphasia. Adding the other etiologies of aphasia, the number of People With Aphasia (PWA) in France is estimated at more than 300 000 (Courbet, 2026).

Aphasia happens in a moment of the life of a person who was mastering the language. On the first hours of the occurrence of the stroke, the aphasia is in the hyper-acute phase (0-24 hours). This phase is followed by the acute phase, which lasts seven days (1-7 days). In the following weeks, the phase is named the early subacute phase (7 days - 3 months) and is followed by the late subacute phase (36 months). After six months, we talked about a chronic phase of aphasia (Bernhardt et al., 2017). Depending on the area of the brain affected, the impact on the communication will be variable. The rehabilitation of aphasia is based on the principle of neuroplasticity. Brain functions can be reorganized by transferring the activity of damaged networks to redundant networks or to networks that previously supported the affected functions (Raymont & Grafman, 2006).

The different types of aphasia are classified according to two approaches. The first one is based on the syndromes and the second one is based on neurosciences and medical imaging techniques (Carpentier, 2023). There are two main types of aphasia: the fluent and the non-fluent ones (Chomel-Guillaume et al., 2021). Broca's aphasia is a non-fluent aphasia where the comprehension is preserved and the repetition altered. Global aphasia is the most severe one, where all functions are altered. This global aphasia can evolve into a mixed non-fluent aphasia. The transcortical motor aphasia is characterized by a default of incitation and initiation of spontaneous oral production. Wernicke's aphasia is a fluent type where comprehension and repetition are altered. The conduction aphasia, as it is named, results from a disconnection between two cortical centres. The anomic aphasia is fluent and the person has an inability to supply words, like in the transcortical sensory aphasia. In subcortical aphasia, the language is fluent but the volume of the person speaking is reduced.

Table 1: Aphasias types described by Chomel-Guillame et al., in 2021.

Types of Aphasia	Expression	Comprehension	Repetition
Broca	Non-fluent	Preserved	Altered
Global	Non-fluent	Altered	Altered
Mixed non-fluent	Non-fluent	Altered	Altered
Transcortical motor	Non-fluent	Preserved	Preserved
Mixed transcortical	Non-fluent	Altered	Preserved
Wernicke	Fluent	Altered	Altered
Conduction	Fluent	Preserved	Altered
Anomia	Fluent	Preserved	Preserved
Transcortical sensory	Fluent	Altered	Preserved
Subcortical	Fluent	Preserved	Preserved

To respond to all of these types of aphasia, there are many ways to rehabilitate people. The type of aphasia and its symptomology will determine the care. For Chomel-Guillaume et al. (2021), the assessment of language requires taking into account the fluency of the aphasic person. Speech-Language Pathologists (SLPs) personalise the care of each patient. They propose a rehabilitation program based on semantic exercises and cognitive functions. For example, methodologies such as Semantic Feature Analysis (SFA) consist of stimulating the semantics networks to improve word retrieval abilities (Boyle, 2010). The PCA (Phonological Component Analysis) is quite similar to the SFA but stimulates phonological evidence like phonemes in place of semantic one (Leonard et al., 2008). Another method is the Constraint-Induced Language Therapy (CILT), which is based on the Constraint-Induced Movement Therapy (CIMT) (Haute Autorité de Santé – HAS, 2022). The goal here is to force the use of language in exercises in order to encourage communication. The Intensive Language-Action Therapy (ILAT) is based on the same principle but also encourages non-verbal forms of communication (Difrancesco et al., 2012).

These rehabilitation exercises can be promoted through various forms (paper, IT solutions and so on). Oussama et al., (2021) examined applications designed for the rehabilitation of people with disabilities. They identified the types of applications, the platforms used, and the level of support required from the SLP for each task. The applications were basic, with a 2D interface in 68.2% of cases. A few immersive solutions were offered; twelve studies mentioned eight different technologies using augmented reality or virtual reality. The supports used were primarily computers (51.1%) or tablets (40.4%); only one article mentioned the use of a smartphone. In fact, relatively few of the studies identified in this literature review proposed fully autonomous use (15.9%). Mashima and Doarn (2008) described the use of telehealth rehabilitation in aphasia. In fact, providing telehealth permits to respond to the geographical constraints of care, like the lack of specialists.

It is also interesting to reduce the time of travel and patient's fatigue. Also, telehealth rehabilitation promotes a longer time of care, which is really relevant in aphasia because rehabilitation can continue even in chronic phases (Kahlaoui & Ansaldo, 2009). Moreover, it has been shown that telerehabilitation improves significantly the quality of life after the intervention (Güngör Ketenci et al., 2026).

Indeed aphasia is one of the conditions that most significantly affects quality of life. Lam and Wodchis (2010) conducted a study where they examined health- related quality-of-life measures through multiple diagnoses. The largest negative impacts measured were related to neurologic conditions like aphasia and Alzheimer's disease or Huntington's chorea and cancer. Depression is also very prevalent after a stroke. Three months post-stroke, 70% of the population met the criteria for depression, and this proportion remained high at twelve months (62%). (Kauhanen et al., 2000).

ANALYSE OF NEEDS

In the design of a system, providing a user-centered approach will promote end-user needs, leading to requirements for designing the solution. This process is iterative. The solutions will be compared to the requirements and re-evaluated as much as necessary (Norman, 1981, and ISO 9241-210:2019, 2019). This process involves the end user and contributes to the acceptance of the design solution. Yardley et al. (2015) emphasize this principle in talking about a "person-based" approach. They explained that involving the target user population at every stage of the design process helps to understand users' psychosocial context and to provide a more persuasive intervention. It also guides the development process. To develop a system dedicated to aphasia rehabilitation, we wanted to take into account the end-users, i.e. the SLPs.

Semi-strucutre grid will be provide to conduct interviews with SLPs. Questions will focus on the care they provided, the population of PWA they treated and the environment of their exercise. They will also be asked about their use of technologies in rehabilitation and their expectations regarding rehabilitation technologies. Their verbatim transcripts will provide some guidelines for the design.

METHOD

Participants

Eight SLPs participated in the study. They were all female and aged from 26 to 54 years old ($M = 38.75$; $SD = 9.77$). They practise in France or in Belgium. Their experience as SLP varies from 2.5 years to 31 years, with an average experience of 15.69 years ($SD = 9.14$). Their practice of care takes place in public hospitals ($n = 4$), in private clinics ($n = 1$) and as self-employed ($n = 2$). One SLP had mixed activity between public hospitals and the self-employed.

Semi-Structured Interviews

We conducted eight remote interviews with SLP. Recruitment was carried out through mailing lists and SLPs networks. The interviews were conducted in French. They were recorded through a videoconferencing system. They were then transcribed using a local AI-powered speech-to-text tool (Whisper transcription tool, version 0.3, OpenAI Whisper). The interview grid explored organizational aspects of care, such as patient referral and coordination with other professionals. Questions then focused on the care of PWA, including the intensity of sessions, the personalization of sessions, and the assessment and rehabilitation of PWA. We also asked professionals about their use of technological devices and whether they encountered any challenges in using them.

RESULTS

The PWA represented approximately 50% of the rehabilitating population for five SLPs. Two speech-language pathologists provided different estimates of this approximation, with one citing 60% of the population and the other 40%. Only one self-employed SLP had 25% of patients with aphasia pathology. The care begins after hospitalization for all SLPs, during the subacute phase. One SLP with a private clinic activity explained that, in most of the cases, the patients stay no longer than three months. Three SLPs reported providing care in the acute phase when the patient's hospitalization is brief. In hospitals and private clinics, SLPs' patients are addressed by the physician coordinator of the rehabilitation centre. The three self-employed SLPs are identified by a family physician or through word of mouth. One of them is also identified through dispositive accelerating care after stroke, which identifies professionals. Two SLPs described their work in coordination with occupational therapists, one focusing on the use of Augmentative and Alternative Communication (AAC) tools and the other on organizing group sessions.

At the beginning of the care, SLPs are all providing a standardized assessment. It is based on aphasia batteries to test the alteration caused by aphasia. Seven SLPs provide intensive session care with three to five sessions per week of 45 minutes and 30 minutes for people with fatigue feelings.

PERSONALIZATION

The personalization of care begins with the choice of batteries of assessment, as mentioned by one SLP. This one is adapting it to the profile of the patient. Three of the SLPs take into account the sociocultural level of PWA to estimate the language they were proficient in before aphasia. The other three SLPs mentioned the patient's occupation or profession. Six SLPs are adapting the rehabilitation of PWA according to their assessment or their preserved and affected language processes.

Four SLPs are asking the family or caregivers for some information. In order to provide a better understanding of PWA from someone close to them.

Three of the SLPs take into account the complaint or the expectations of the patient, the patient's living environment and the family surrounding. Two SLPs are also asking the patient directly or the family about their centre of interest. Some patients are better focused during the exercises when they concern their areas of interest, like expressing by this SLP; "Here, I'm thinking of a patient; if we offer him tasks that are completely outside his areas of interest, I don't have him with me during rehabilitation, so I will choose stimuli based on what interests him, and from those stimuli, I will use them.".

USE OF TECHNOLOGICAL DEVICES

Three SLPs use technological devices for computerised assessment. One use it only to provide the assessment batteries and two others to support the baseline. The baseline assessment consists of presenting a list of words, with one subset used during rehabilitation and the other serving as a control to demonstrate the effects of rehabilitation and minimize learning effects during subsequent assessments.

Five SLPs use devices to promote AAC. They are mostly provided through applications on phones or tablets. Some examples of these devices are: Let Me Talk, C-board, Assistant parole, and Médipicto. Two SLPs based their AAC on the tools that patients already have at their disposal. For example, PWA can use their photo gallery or text-to-speech functions to communicate.

Five SLPs are using applications or websites referencing rehabilitation exercises dedicated to PWA. They use it with the patient during the rehabilitation session ($n = 5$), at home completed in autonomy by the patient ($n = 6$) or in the waiting room while they are finishing with the previous patient ($n = 1$). The tools used by SLPs for rehabilitation exercises are: Tactus therapy, Cérébro, LangageOral.com, LangageEcrit.com, FonctionsExecutives.com (compiled in Altinae), and HAPPYneuron.

Two SLPs mentioned using artificial intelligence (AI) to personalize rehabilitation exercises. This helps them to create exercises tailored to the patient's specific needs and also allows them to generate repetitive exercises.

INTEREST AND LIMITS OF TECHNOLOGICAL DEVICES

Advantages

The SLPs using patients' devices emphasize the benefits of providing the use of phones and tablets, since they are already familiar with. For one SLP, using applications and website rehabilitation exercises permits expanding the types of media used: "And as for my patients, I find it much more rewarding to work with different media." The variation of support avoids feeling limited by the technologies: "I haven't yet reached the full potential of the software I use because I don't use it all the time." Two SLPs expressed that the technological devices are improving patient autonomy and communication.

Limitations

As for limitations, the cost of the technological devices was highlighted. One SLP mentioned that, in most cases, the applications are not free and even when they are, they are beta versions. Furthermore, while some financial aid may be available, the time required to apply for it has often led patients to invest in a free applications on their own is underlining another SLP.

One professional acknowledged that the content of some digital exercises is childish and unsuitable for adults. Another SLP mentioned that she was using a digitalised list of items to prepare her sessions but did not use them in real time because some of the exercises were inappropriate. Another mentioned that some baselines are simply too long. Four SLPs expressed frustration regarding the practical use of technological devices concerning their customization and configuration. One of them would like a personalized device for each patient in order to provide exercises tailored to their abilities: "That said, it's very complicated, but it's true that sometimes there are errors that aren't easy to fix. I'm going to take a look at a page of semantic intruders. I can't configure it, and I really miss being able to do that." Another drawback of one SLP regarding predefined, non-customized exercises is that some of them do not meet her expectations: "Actually, it's often the exercise itself that's way off the mark; sometimes I get the impression it wasn't designed by a speech-language pathologist [..]".

Two SLPs who used telerehabilitation reported that there was no correction for the exercises provided at home. There is no direct adapted feedback for the patient, which could make exercises more effective for rehabilitation.

DISCUSSION

The use of technological devices in telerehabilitation settings is not the primary context for the use of these technologies. SLPs often proposed this option for PWA who are in demand of rehabilitation exercises or when there is a caregiver to rely on. For independent rehabilitation, SLPs mentioned that they were expecting more feedback from the systems for them and the patient to correct oneself. For the personalization of exercises, one SLP was positive about the actual possibility of the tools' personalisation, what contradicts the proposal of three other SLPs. But they all verbalize one parameter of the personalization needed by the rehabilitation of PWA. Personalizing the exercises of rehabilitation increases the motivation of the participants.

Using the technological devices of PWA, provides autonomy and encourages their communication. The use of AI offers SLPs hope of improving their practice and the possible functionalities of AAC. For example, the application can predict the word that the patient wants to use, based on his preference, to initiate it. SLPs also highlight the essential adaptability needed for the devices, which can be supported by AI's ability to update itself as the patient progresses.

Aphasia and its impact on language have been described, but the traumatic injury or stroke can lead to other sequelae beyond those related to communication. Many PWA have physical disabilities, like hemiplegia, a

paralysis affecting one side of the body. As a result, they have only one hand available to use their device, they use a wheelchair or have difficulty moving around. This condition prevents them from carrying an AAC device or any other similar object. Other visual impairments prevent them from visually exploring technological systems and hinder their use.

CONCLUSION

Aphasia is a language disorder affecting the communication abilities of people. To address this, SLPs facilitates rehabilitation through exercises presented in various supports. Among the wide variety of exercise forms they use; they also rely on technological devices. They are designed for assessment, for rehabilitation, and for AAC. Indeed, SLPs do more than just rehabilitate; they promote the use of systems to help PWA in their daily lives. Some solutions are really simple, such as a text-to-speech reader; any solution is valid as long as it promotes communication.

To contribute to the development of technological devices responding to the end-user need in the rehabilitation of PWA, interviews were conducted with SLPs. They expressed frustration with the lack of personalization of technological devices. The issue is to design devices addressing patients' rehabilitation needs while meeting the expectations of SLPs' clinical practice. To fully address all the needs of end users, that is, those involved in aphasia rehabilitation, there is a need to tailor interviews for PWA and their caregivers. Their needs will provide guidelines for the design of technological devices.

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