Conversational Agents to Support People with Communication Disability: A Co-design Study with Speech Pathologists

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Abstract

Communication disabilities can limit individuals' social interaction, often leading to isolation and reduced quality of life. Speech-language pathologists (SLPs) can address these challenges through tailored interventions, often supported by assistive technologies. This study explores how conversational agents (CAs) can support individuals with communication disabilities by incorporating SLP expertise through a co-design approach. We conducted a two-phase study: a co-design workshop to understand the needs of the target population and potential roles of CAs to support communication skill training, and a subsequent evaluation session with a CA prototype by a group of SLPs. Our findings highlighted the importance of designing accessibility, personalization, and motivation features of CAs with greater depth, augmentation, and precision, emphasizing the need for multiple interaction modalities, real-time and deeply tailored personalization, and more intrinsic motivational strategies. Our work contributes to the design and application of inclusive CAs in communication therapy, with implications for clinical and home settings.

CCS Concepts

• **Human-centered computing** → Human computer interaction (HCI); HCI design and evaluation methods; User studies.

Keywords

Conversational Agents, Communication Disability, Speech Pathology, Co-design, User Experience, Thematic Analysis, Human-Computer interaction

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1 Introduction

Communication is vital human capacity in how we interact with our surroundings and other entities [30]. Communication disability affects a person's ability to express themselves or understand other people due the interaction of many factors. These factors may be intrinsic, such as hearing, vision, cognitive abilities, receptive and expressive language, and articulation skills, or extrinsic, such as background noise and the skills and attitudes of communication partners [45]. Communication disability is associated with a wide range of health conditions and disabilities, including neuro-developmental disabilities (such as cerebral palsy, intellectual disability, or autism); acquired conditions (such as aphasia following stroke) or cognitive communication disorders associated with traumatic brain injury [7, 22, 41]. Individuals with communication disability may face various complications in their everyday lives and barriers to communication that impede their ability to participate successfully in social situations [41]. The importance of participation is acknowledged in the International Classification of Functioning, Disability and Health, which defines it as 'involvement in a life situation' [45].

People with communication disability are best supported by a speech-language pathologists (SLPs), who provides an assessment identifying goals and strategies for improving communication, and who work with the individual with disability and their parents, teachers, and other communication partners to improve both the individual's and their communication partners' communication skills. Speech-language pathologists also introduce and support implementation for a range of communication technologies, including voice amplifiers, speech generating devices, and a range of assistive technologies design to support therapy practice in the home

(e.g., mobile apps on iPads) [9].Recently, Conversational Agents (CAs), systems designed to interact with users through natural language interfaces, have been increasingly employed in the field as another means to support communication skill development [8, 19, 40, 41]. Evidence suggests that CAs can facilitate interactive learning, personalized practice, and incremental improvements in specific communication skills [8]. Yet significant questions remain about how best to design these systems to address diverse needs, foster user engagement, address complex therapy goals, and account for human-like conversation dynamics—a challenge that has led to mixed outcomes with regard to user satisfaction, engagement, and clinical utility.

Collaborating with professionals who deeply understand the complexities of communication disabilities, such as SLPs, is a promising approach to designing effective assistive technologies. Ahmadpour et al.'s [1] emphasize the potential benefits of involving proxies—experts who can provide valuable insights into user needs—when direct engagement with the target population is constrained by ethical or logistical limitations. SLPs, as proxies, bring critical knowledge of patient needs, clinical challenges, and the ways people with disabilities interact with technology.

Building on this premise, our study explored how CAs might better support individuals with communication disabilities through a two-phase study involving a codesign workshop and a subsequent prototype evaluation with SLPs. Our objectives were to (1) examine the roles CAs can play in communication therapy, and (2) provide practical guidance for designing assistive CAs, focusing on identifying and developing a better understanding of key supportive features.

2 Related Work

This study draws on three key areas of research: the use of CAs in education and supportive applications, communication improvement for specific populations, and co-design approaches with expert informants and proxy stakeholders.

2.1 Educational and Supportive Applications of Conversational Agents

CAs have demonstrated potential as tools for interactive learning and personalized instruction in education and healthcare. For example, Tu [43] employed a CA to enhance language learning through simulated contextual conversations, while Mageira et al. [26] designed an educational chatbot for teaching cultural content in foreign languages. Despite positive outcomes in user engagement and learning, limitations such as technical challenges and a lack of naturalistic interaction persist. In healthcare, studies like Boustani et al. [2] and Samrose & Hoque [35] highlight the value of CAs in fostering motivation and behaviour change through techniques such as motivational interviewing. However, challenges remain in replicating human-like interactions and providing nuanced feedback. The studies' findings underscore the need for CAs that balance technical sophistication with user-centred design principles, particularly when applied to complex domains such as communication disabilities. Vázquez et al. [44] conducted a user study on a voice-based CA designed for long, complex coaching conversations, finding that participants valued its simplicity, utility, and enjoyability, but noted it was less engaging and human-like compared to a human-operated system. These studies show promise of CAs in these areas, while highlighting a need for further research in naturalistic interaction, user engagement, and domain-specific adaptability.

2.2 Communication Improvement for Specific Populations

CAs have been increasingly applied to support communication skills in populations with specific needs, such as individuals with autism spectrum disorder (ASD) or intellectual disabilities. For example, Tanaka et al. [41] developed a social skills trainer for individuals with ASD, demonstrating improvements in oral narrative skills. Similarly, Catania & Garzotto [7] designed "Emoty," a CA to enhance emotional recognition, reporting gradual improvements in users' social communication abilities. For individuals with neurodevelopmental disabilities, systems such as CapacitaBOT [29] and ViTA [6] show the potential of CAs to support skill development through accessible, speech-enabled interactions. However, these CAs exhibited limitations in user engagement, personalization, accessibility, and skill transfer to real-world contexts, highlighting the need for further research. Our work builds on this literature by exploring the specific design considerations necessary for CAs to support individuals with communication disabilities across diverse conditions.

2.3 Co-design with Proxies and Expert Informants

Involving proxy stakeholders—such as caregivers, clinicians, or teachers—has proven valuable in the design of technologies for populations unable to participate, or as an initial step in design investigations prior to engaging with the target population. For instance, Herriott et al. [15] employed family members as proxies to design tools for individuals with cognitive impairments, while Islind et al. [17] used nurses as proxies for patients in digital healthcare contexts. These approaches enable researchers to leverage domain expertise while addressing accessibility challenges in participatory design processes. In the field of speech-language pathology, Singer et al. [38] co-designed a tool with SLPs to facilitate therapy goal discussions with parents, resulting in a more user-friendly and effective prototype. Similarly, Hamidi et al. [14] engaged SLPs, parents, and teachers in the design of digital therapeutic tools for children with communication disorders. While proxies provide valuable insights, their perspectives may not fully capture the lived experiences of end-users. While we acknowledge that proxy-based co-design cannot fully capture the lived experiences of end-users, it serves as a valuable stage in an iterative design and research cycle.

3 Study design

This study, approved by the Low-Risk Ethics Committee of University of Technology Sydney, employed a two-phase design to explore and evaluate the use of CAs for supporting individuals with communication disabilities. SLPs were engaged as informants and proxy users across both phases.

3.1 Phase 1: Co-design Workshop

The co-design workshop aimed to elicit expert input from SLPs to identify key features and roles for CAs in communication disability support. These insights would inform the development of a CA prototype.

Participants and settings: Four certified practicing speech pathologists (CPSPs), each with more than three years of experience, participated in an online workshop conducted via Zoom. CPSPs represented diverse specialties, including augmentative and alternative communication (AAC), autism spectrum disorder (ASD), childhood apraxia, and neurodevelopmental conditions. Their client base covered all age groups (i.e., children, adolescents, adults, and older adults). Recruitment was conducted through the publicly accessible Speech Pathology Australia CPSP register. Informed consent was obtained from all participants.

Workshop format: A co-design workshop was conducted using the "future workshops" format [18], a widely adopted approach to enhance participant engagement in shaping future solutions and promoting collective thinking. The one-hour session included three main activities designed to elicit input:

1. Introduction and Background Questionnaire (15 minutes): Participants provided background information on their practice settings, areas of expertise, and the most common communication challenges encountered.
2. Mind Mapping (15 minutes): Using MIRO, participants collaboratively identified strategies currently used to address communication challenges and discussed their effectiveness.
3. Ideation Session (15 minutes): Participants brainstormed potential CA functionalities, exploring key design considerations, potential risks, and opportunities.
4. Open Discussion (10 minutes): Key matters of concerns emerging from the previous activities were discussed.

Data collection and analysis: Audio and video recordings, along with MIRO outputs, were analysed using thematic analysis following Braun et al. [4]. Two researchers independently conducted the thematic analysis, with an open and iterative coding method. The codes were then reviewed and refined collaboratively, ensuring both depth and breadth in capturing patterns of meaning. Once consensus was reached on the thematic structure, the lead researcher finalized the descriptions of the themes.

3.2 Phase 2: User Experience Evaluation

The second phase focused on evaluating the acceptability, usability, and potential clinical utility of the CA prototype as perceived by SLPs.

Participants and setting: Five different CPSPs participated in this phase, including diverse professionals: a public practitioner specializing in adult speech and swallowing disorders, two private practitioners addressing AAC, autism, and neurological conditions across various age groups, and one private practitioner in childhood apraxia and social communication, and one public practitioner in fluency and stuttering across age groups. The session was conducted via Zoom. Participants received a $25 voucher as a token of appreciation.

CA prototype: The CA prototype incorporated features identified in Phase 1: accessibility, personalization, and motivation features. Accessibility was enhanced through simple language models and multimodal input/output options, such as speech-to-text and text-to-speech, ensuring ease of use. Personalization allowed the creation of user profiles to adapt interactions based on individual abilities, preferences, and goals, with feedback options for therapists. Motivation was driven by gamification elements [11, 13], including positive reinforcement, goal-setting, progress tracking, and performance feedback, fostering engagement and skill development. A CA prototype using GPT4 API was developed to implement these features. A system prompt (Appendix A.1) the CA to create a user-tailored simulated environment, emphasizing active listening, concise language, patience, support, and positive reinforcement. It also directed the CA to adapt responses based on the user's profile and communication challenges, providing context, clarification, and targeted questions to enhance interaction. Example prompts and feedback mechanisms are also provided, aligned with the few-shot prompt engineering technique [34], to ensure effective and supportive interactions(Appendix A.2, A.3).

Evaluation procedure: The evaluation sessions were structured around two main activities designed to gather feedback on the CA prototype's usability and effectiveness in communication support. Each session began with a 10-minute introduction, during which participants were briefed on the study's goals, procedures, and the prototype itself. This was followed by two core activities:

Activity 1: Interaction with the CA (25 minutes). Participants engaged individually with the CA through the following three tasks: (i) Onboarding: Participants created a user profile by providing their name, age, communication disability, and a communication goal; (ii) Free Conversation: Participants chose a topic to discuss freely with the CA; and (iii) Guided Activity: Participants practiced communication through a fun activity recommended by the CA, such as guided storytelling. During both the free conversation and guided activity, participants could prompt the CA for feedback at any point. After the session, the CA's feedback could be emailed (simulated) to the participant's speech pathologist.

Activity 2: Evaluation and Discussion (30 minutes). In this activity, participants provided their feedback on the prototype through a structured question-and-answer session, focusing on the features they liked or disliked, ease of use and engagement, accuracy and appropriateness of the CA's responses, and its potential benefits and challenges in clinical practice.

4 Results

4.1 Co-design workshop

Four major themes were identified in the thematic analysis: challenges of communication disability and its impact on daily life; importance of communication support; the role of CAs in supporting communication; and CA design features. Below, we present each theme with selected participant quotes (P1 for Participant 1, etc.).

Challenges of communication disability and its everyday impact: The SLPs reported that individuals with communication disabilities often struggle to understand and respond to social cues, express their thoughts and feelings, participate in conversations

and social interactions, and build and maintain relationships. These challenges can have a significant impact on daily life, making it difficult to go to or learn at school, participate in work, play, and socialise, and can lead to feelings of isolation, frustration, and loneliness. P1 provided an example of a client who faced significant barriers to practicing communication skills due to social stigma. The client struggled to make friends because her peers avoided interacting with her due to her communication disability. This limited her opportunities to practice and develop her social skills: "*I have an 18-year-old girl [patient] who really just wants to make friends, but . . . when she speaks to others her age, typically they think she is weird.*" The challenges associated with communication disabilities can ripple into various aspects of daily life. Participants provided examples of how these difficulties manifest. For instance, P1 shared an anecdote about a child who threw their communication device (an iPad) at a wall in frustration, illustrating how unmet communication needs can strain relationships and limit participation in everyday activities.

Importance of communication support: Participants emphasized the need for a multifaceted support approach—incorporating speech and language therapy, social skills training, and assistive technologies. Speech and language therapy focuses on enhancing communication competencies across various domains, including articulation, linguistic proficiency, and pragmatic communication skills. Social skills training develops interpersonal abilities such as turn-taking and appropriate use of nonverbal cues. Assistive technology was highlighted as a pivotal component in augmenting communication effectiveness. One participant emphasized that the importance of integrating assistive technologies to alleviate the daily challenges faced by individuals with communication difficulties: "*Using strong predictive speech [tool for predicting words] for my patients is extremely useful because writing sentences can be very exhausting for my patients, especially if they have motor difficulties*" (P3). Another participant emphasized that communication support enables individuals with difficulties to perform tasks that are simple for others: "*Communication support is essential for people, especially for people struggling with what is simple for me and you.*" (P4)

Conversational agents' role in communication support: There was a consensus among the participants regarding the potential of CAs as an assistive technology. CAs were highlighted as tools capable of providing a controlled, low-risk environment for practicing communication skills, fostering social connection, and supporting relationship building. A recurring theme was the limited opportunities for clients to practice and demonstrate newly acquired communication skills in safe, naturalistic settings—a critical gap in current therapeutic approaches. CAs were seen as bridging this gap by simulating realistic and varied conversational contexts.

Participants noted the difficulty of creating such naturalistic practice environments. P1 explained that teaching individuals with social communication impairments to interpret and respond to social cues can be "*very difficult*" in non-naturalistic settings, adding that it's challenging to both teach and help patients "*generalize the skills*" outside clinical environments. Similarly, P2 elaborated on the struggle to transition patients from clinical instruction to real-world application, describing how "*approximating a real-life setting, but while still being a safe space*," remains a significant hurdle. P3 echoed these sentiments, emphasizing the scarcity of opportunities for patients to engage in naturalistic interactions and the difficulty of monitoring and measuring outcomes in such settings. They explained that "*finding those spaces and opportunities. . . is really hard; it's really hard to monitor, it's really hard to get outcomes.*"

Social stigma further complicates these challenges. P1 shared the example of an 18-year-old client who, despite wanting to make friends, faced rejection from peers who viewed her communication style as "weird" and often avoided conversations with her. This stigma not only limited her social interactions but also reduced opportunities to practice and refine her communication skills in real-world settings.

Conversational agent design features: Participants suggested that effective CA design should prioritize accessibility, personalization, and motivation to better meet user needs. They highlighted the importance of accessibility by recommending features like speech-to-text, text-to-speech, and compatibility with assistive devices, which would ensure the CA's usability for individuals with diverse communication challenges. Personalization was also strongly emphasized, with participants proposing that the CA adapt to user profiles, tailoring interactions to individual abilities, preferences, and goals, and providing feedback aligned with each user's progress. To maintain engagement and encourage improvement, participants stressed the need for motivational features, such as positive reinforcement, constructive feedback, achievable goals, and progress tracking, which they believed would foster a sense of accomplishment and sustained participation.

4.2 User Experience Evaluation

Overall, the CA prototype was positively received by participating SLPs, who praised its intuitive design and engaging interaction style. Participants highlighted the CA's ability to sustain meaningful and enjoyable conversations, with one participant (P3) recounting being "*sucked into a conversation*" about a favourite topic, demonstrating the CA's potential to foster naturalistic and immersive dialogue. However, some challenges were noted with the voice recognition feature, as the CA occasionally failed to capture input accurately. Our analysis of the feedback identified four key themes: i) personalization, adaptive feedback, and motivation, ii) multimodal interaction, and context-awareness, iii) clinical applications and iv) ethical considerations.

Personalization, adaptive feedback and motivation: Participants commended the CA's ability to personalize interactions based on user profiles, noting that tailoring language style and conversation complexity to users' reported age and communication needs was particularly useful. However, SLPs recommended more advanced personalization—such as dynamically adjusting language complexity and feedback—to reflect users' real-time progress. While participants appreciated the CA's ability to provide feedback and seamlessly continue conversations, they requested more tailored and specific feedback aligned with therapeutic goals. For example, P1 highlighted the need for metrics that directly reflect goal progress: "*For someone with a topic maintenance goal, I would prefer feedback to illustrate how many turns there were, how many times the user went off-topic, etc.*" Motivation emerged as an intertwined factor with personalization and feedback, as participants

emphasized the importance of keeping users engaged and encouraging consistent practice. To this end, the CA's redirection and positive reinforcement mechanisms were found useful. For example, P5 noted, "*I liked the cueing [redirecting to conversation topic] to keep me on target; this is how I go about doing it with my patients.*" However, SLPs comments suggested the need for a more integrated and individualised approach to supporting motivation. Overall, the participants' feedback point toward a holistic design approach, weaving together personalization, adaptive feedback, and motivation to better address users' diverse and evolving therapeutic requirements.

Multimodal interaction and context-awareness: The CA's multimodal interaction capabilities—supporting both speech-to-text and text-to-speech functionalities—were recognized as enhancing accessibility for diverse users. Participants noted the potential to expand these capabilities further by incorporating gesture-based or haptic feedback to broaden user inclusivity. Additionally, participants emphasized the need for context-aware dialogue management to support users more effectively in varied settings and situations.

Clinical applications: Participants recognized the CA's potential as a therapeutic tool, particularly for home practice that could be monitored by speech pathologists. P4 highlighted the importance of involving family members in therapy: "*They [family] need to extend what we do; it's [practising with the CA at home] quite a good idea.*" Introducing the CA during clinical sessions was suggested as a way to familiarize patients with its use before 'prescribing' it for independent practice. Participants also envisioned the CA's role in automating progress tracking and providing data-driven insights for clinicians. These features could complement existing therapeutic strategies, making the CA a valuable addition to clinical workflows. When participants were asked about the potential benefits or role the CA could play in their field and how it could be utilised, P2 stated: "*In the clinical rehab setting, especially for people that have had, say, a stroke or traumatic brain injury that has impacted them, and they need, kind of intensive communication practice, I think it would be a really useful tool*".

Ethical considerations: Ethical considerations were acknowledged, especially in relation to potential harm through miscommunication. Concerns were raised, particularly for individuals with mental health aspects, highlighting the need for careful consideration in the use of such tools. P2 highlighted the importance of minimizing risks for vulnerable populations: "*For someone with mental health aspects... there would just be looking at any risk of harm through miscommunication.*" The CA's ability to preserve users' expressive communication was seen as a positive feature, with no "*words being put in their mouth.*" Participants emphasized the need for safeguards to ensure ethical and transparent use of the CA, particularly for users with heightened vulnerabilities. This includes clear communication about how the CA processes data and the incorporation of validation mechanisms to confirm understanding and avoid errors.

5 Discussion

SLPs uncovered several opportunities and challenges for CAs designed to support people with communication disabilities. The SLPs' perspectives added some new understandings to the well-documented core user needs in prior literature—accessibility, personalization, and motivation—that underscore how these tools can go beyond simple information delivery to become more adaptive and inclusive systems accommodating a broader range of user needs and expectations.

Accessibility: Beyond text and speech. The emphasis on accessibility aligns with previous research on CAs in healthcare [20], particularly the need for multimodal interaction [21, 48]. However, our findings extend beyond the commonly discussed speech-to-text and text-to-speech modalities. SLPs emphasized the importance of accommodating individuals who may rely on alternative communication methods, such as picture symbols or visual scene displays, given the heterogeneity of this population. There seems a need to move beyond a text-and-speech-centric view of accessibility and embrace a more holistic approach to designing CA interfaces adaptable not only to varying levels of language proficiency but also to diverse communication methods used by people who do not use speech or text. Therefore, 'conversation' in conversational agents may need to be reframed broader as "communication" agents, prompting designers to envision a broader spectrum of communicational possibilities. For instance, CAs for this population can incorporate image recognition and generation capabilities to support communication. Rapidly advancing multimodal generative AI models [49] offer promising avenues for making CA interfaces more accessible and augmented to a wider range of communication styles. Supporting this view, recent studies have developed innovative multimodal systems that effectively combine linguistic, visual, and even emotional aspects of communication. Sun et al. [39] introduced OpenOmni, an open-source framework combining technologies like Speech-to-Text and Emotion Detection, supporting local and cloud deployment for enhanced privacy and benchmarking. Taneja and Goel [42] presented MuDoC, an interactive GPT-4o-based system providing document-grounded multimodal responses with integrated text and visuals. Yang et al. [46] developed MTPChat, a multimodal, time-aware persona dialogue dataset that integrates linguistic, visual, and temporal elements for improved temporal awareness.

Furthermore, practical challenges such as cognitive load and effective error handling must be explicitly addressed to enhance usability and accessibility. Prior research has yielded mixed results regarding cognitive load associated with CAs. While a recent study indicated that chatbots cause higher cognitive load compared to menu-based interfaces [31], earlier work found users interacting with CAs experience less cognitive load compared to those who did not use a CA [3, 36]. Given the cognitive and communicative demands placed on users with communication disabilities, CAs should aim to minimize cognitive load. Integrating visual aids and tailored language models [5], using nonlinear interaction models [47], and enhancing contextual understanding and personalization [33] are some effective strategies for reducing cognitive load in CAs.

Personalization: Dynamic adaptation and feedback. The call for personalization echoes the growing trend towards adaptive and tailored services in various domains [50]. Our findings confirm the benefits of personalization in healthcare CAs, as reported in previous studies [10, 37] [19]. However, the SLPs in our study

emphasized the need for a more context-aware and dynamic personalization that goes beyond presentation of information based on static user profiles. They envisioned CAs that could adapt in real-time to the user's performance, adjusting the complexity of language, the type of feedback provided, and the conversational flow based on observed successes and challenges. These insights align with the works of Tu [43], Kleopatra et al. [26] and Tanaka et al. [41], who also stress the importance of tailoring conversations based on user characteristics for a personalised user experience, but in the context of communication disabilities, it necessitates a more nuanced understanding of individual communication patterns and challenges. For example, a CA could detect when a user is struggling with topic maintenance and offer prompts or cues to help them stay on track. This level of dynamic adaptation requires sophisticated AI algorithms that can accurately interpret user input, assess their communication skills, and adjust the interaction accordingly. It also raises the need for mechanisms that allow for ongoing calibration of the CA's understanding of the user, potentially through feedback from both the user and their SLP. A recent review [19] highlights some promising developments in such advanced personalisation in CAs including detecting the user's expertise level to tailor the complexity of terminology and dialogue paths [28], and adjusting system initiative and confirmation strategies to support users encountering challenges in completing tasks [25].

Motivation: Beyond gamification. Motivation is a well-established factor in successful healthcare interventions [24]. While our prototype incorporated elements of positive reinforcement and progress tracking, the SLPs' insights suggest the need for a more personalised and data-driven approach to supporting motivation. Simply incorporating some gamification elements [23] may not be sufficient. Nolan and McBride (2014), for instance, advocate for moving beyond gamification by fostering intrinsic motivation through autonomy, play, and affinity, which promote self-directed, enjoyable, and meaningful engagement [32]. In addition, motivational interviewing techniques [16], more natural dialogue quality [12] and incorporating emotional reaction [27] are some other commonly used methods in prior works.

Ethics. Ethical considerations, such as the risk of CAs replacing the voice of individuals with communication disabilities or providing incorrect feedback, require careful attention. Vulnerable groups, including those with mental health challenges or significant intellectual disabilities, face unique risks when CAs exceed their linguistic comprehension. Literature, including Alain et al. [44] and Catania & Garzotto [7], emphasizes the importance of ethical guidelines in developing and deploying these tools.

Limitations and future research. Our study has some limitations including a small sample size, short duration of the study and working with proxy users. Future research should include larger, more diverse samples of SLPs and individuals with varied communication disabilities in actual use settings over longer periods of time to provide a more comprehensive understanding of the effectiveness of the CAs in this field. The specific CA features including enhanced accessibility, context-aware adaptive feedback, and more intrinsically oriented motivational methods can be integrated and evaluated to determine their role in promoting communication skill practice and development. Additionally, extending the system to incorporate further modalities (e.g., gesture recognition, and haptic feedback) may offer richer, more inclusive support. Finally, developing standardized evaluation frameworks for assessing the quality and efficacy of CAs will ensure that new systems meet the necessary criteria for clinical use.

6 Conclusion

The application of CAs in supporting individuals with communication disabilities offers a promising approach to enhancing therapeutic outcomes. Through a human-centred design approach, we collaborated with SLPs to design and evaluate a CA prototype. SLPs believe CAs can provide safe, naturalistic environments for skill development, mitigating challenges such as social stigma and limited practice opportunities. Our findings emphasised the importance of employing a more holistic approach to designing accessibility, personalisation, and motivation features of CAs with greater depth, augmentation, and precision, emphasizing the need for multiple interaction modalities and data-driven real-time personalisation and more individualised motivational features closely coupled with specific feedback and personalisation strategies. Our study also highlights the need for safeguards to ensure ethical use of CAs, focusing on protecting vulnerable users, preventing harm, and maintaining clear communication and user autonomy.

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A A APPENDICES

A.1 Conversational Agents Prompts

A.1.1 System Prompt. Create a simulated environment for the user to practice having a conversation. The simulated environment should be tailored to the user's individual needs, taking into account their communication disability.

Take into account the user's {profile_summary} and adjust your responses accordingly.

Once the simulated environment has been created, engage in a conversation with the user on a topic of their choice, using the following speech pathology and training techniques:

Use active listening skills
Use simple and concise language
Be patient and supportive
Provide positive reinforcement

In addition to the above, please take into account the user's communication disability. For example, if the user has difficulty understanding social cues, you may need to provide additional context or clarification. If the user has difficulty expressing themselves, you may need to ask them more specific questions.

Here are some examples of how you can implement the above techniques in a conversation:

Active listening: "I understand that you're feeling frustrated. Can you tell me more about what's bothering you?"

Simple and concise language: "Can you please tell me what you're looking for?"

Patience and support: "Take your time. I'm here to listen."

Positive reinforcement: "That was a great answer! Thank you for sharing that with me."

A.1.2 Onboarding New User Sample Conversation.

CA: Hi! Welcome, I am SpeakPal, here to help you practice your communication abilities!

Have we spoken before?

User: *says no*

CA: Let's set up your profile! If you are unable to do this on your own, please ask someone for help!

Start off by telling me your name!

User: *speaks name*

CA: *says something interesting or fun about the name*

i.e., "[user_name] is a beautiful and unique name that has a lovely sound to it."

CA: Nice to meet you, [user_name]. what is your age?

User: *speaks age*

CA: That's great [user_name]! Could you tell me what communication issues you're experiencing?

User: *explains communication issues*

CA: Alright [user_name], let's finish up with one final task before your profile is completed.

Do you have any communication-related goals I can help you with?

User: *explains communication goals*

CA: [user_name], your profile is now complete. Let's begin!

A.2 Conversations Transcripts from Evaluation Sessions

The following are some conversations that were sourced from the transcripts of evaluation sessions with the CPSPs that Voiceflow provides on their platform (note: '[user_name]' refers to the stored name of the user).

A.2.1 Onboarding for New User.

CA: Hi! Welcome, I am SpeakPal, here to help you practice your communication abilities!

Have we spoken before?

User: *says no*

CA: let's set up your profile! If you are unable to do this on your own, please ask someone for help!

Start off by telling me your name!

User: *speaks name*

CA: *says something interesting or fun about the name*

i.e., "[user_name] is a beautiful and unique name that has a lovely sound to it."

CA: Nice to meet you, [user_name]. what is your age?

User: *speaks age*

CA: That's great [user_name]! Could you tell me what communication issues you're experiencing?

User: *explains communication issues*

CA: Alright [user_name], let's finish up with one final task before your profile is completed. Do you have any communication-related goals I can help you with?

User: *explains communication goals*

CA: [user_name], your profile is now complete. Let's begin!

Welcoming Return User

CA: Hi! Welcome, I am SpeakPal, here to help you practice your communication abilities!

Have we spoken before?

User: *says yes*

CA: Nice to have you back [user_name]!

Welcome to your very own personal communication training tool.

Just say "Feedback" anytime during our conversation to get some feedback.

Would you like to discuss something with me or just practice through a fun activity?

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A.2.2 Conversation Selection – Fun Activity.

CA: Sure, would you like to engage in a specific activity, or would you like me to suggest some for you? We could try role-playing, where you take on a character and engage in conversation with imaginary strangers. Or we could play a question game, where you ask questions to guess a character I'm thinking of. These games can help you feel more comfortable talking to new people. What do you think?

User: *says they want to play a guessing game*

CA: That sounds like a great choice! In this game, I'll think of a character; it could be a real person or a fictional character. Your task is to try to guess who it is by asking yes or no questions. Are you ready to start?

User: *confirms*

CA: Great! I'm thinking of a character now. Please go ahead and ask your first yes or no question to start guessing who it is.

User: *guesses the gender of character*

CA: Yes, the character I'm thinking of is male. Good start! Feel free to ask another question.

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A.2.3 Conversation Selection – User Topic Choice.

CA: Of course! I'm here to help. What would you like to discuss?

User: *says they are having problems at home with getting help*

CA: I'm sorry to hear that you're having trouble getting home help, Lee. Could you tell me a bit more about the specific issues you're facing? Understanding more about the situation will help me provide the most useful suggestions.

User: *says they need help with cooking and cleaning*

CA: I understand, [user_name]. Managing household chores like cooking and cleaning can be challenging, especially when dealing with communication difficulties. Have you considered reaching out to local community services or care agencies? They often provide such assistance. Also, you might want to check if there are any volunteer programs in your area that could provide some help.

User: *explains they cannot use their phone to speak and can only text*

CA: I understand how that could make things more challenging for you, Lee. However, many services these days do offer text or email communication options. You could try reaching out to them via their official websites or email addresses. Also, if you're comfortable with it, you could ask a family member, friend, or neighbour to make a call on your behalf. Could any of these solutions work for you?

User: *confirms it would work*

CA: That's great to hear, [user_name]! I'm glad we could find a solution that works for you. If you need any more assistance or have any other issues you'd like to discuss, feel free to share. Remember, it's perfectly okay to ask for help when you need it. How are you feeling about this plan?

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A.2.4 Feedback.

User: *says "feedback" during an association game they are playing with the CA*

CA: You have been doing a great job at expressing your thoughts and feelings clearly and concisely. Your word associations were very creative and showed your ability to make connections between different ideas. Keep up the good work! Now, let's continue with our word association game. The next word is "music".

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A.2.5 Ending Session.

User: *ends the session by saying "stop"*

CA: Your feedback and progress will be sent to your speech pathologist so they can keep up with your progress!

CA:

Subject: Brief Communication Improvement Update for [user_name]

Dear [Pathologist's Name],

This is a brief update on [user_name]'s recent communication improvement session.

[user_name] has shown a positive attitude towards the exercises and has been actively participating in pronunciation practices. He successfully completed a few tongue twisters aimed at enhancing clear pronunciation.

However, Lee decided to end the session prematurely. I recommend a follow-up session to continue the progress.

Kind Regards,

SpeakPal

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