

Designing an AI Language Assistance System for Elderly Users to Overcome Communication Challenges

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Abstract. This paper addresses the growing communication challenges faced by elderly individuals in the context of demographic aging and the decline of traditional family support structures. While information and Communication Technologies (ICTs) such as mobile phones and video calls have partially bridged the gap between older adults and their families, their complexity, cost, and limited accessibility, together with older adults' language deterioration, continue to restrict effective use. To overcome these barriers, this study proposes the AI Language Assistance Towards the Old (AILATO) system, designed to provide intuitive, customized, and inclusive communication support. Drawing on semi-structured interviews with elderly participants, the research identifies four key problem areas: contextual awareness, clarity of message, adaptability to diverse communication channels, and limited vocabulary or language rules. The AILATO framework addresses these issues through four modules - Context, Message, Channel and Code - each offering tailored strategies to enhance communication skills and intergenerational connectivity. The study contributes both theoretical insights into elderly communication needs and practical implications for AI-assisted tools, highlighting the potential of artificial intelligence to foster inclusivity, reduce isolation, and improve quality of life for older adults. However, several limitations remain, including elderly users' difficulties in adapting to highly flexible AI interactions, the relatively simple interface design, dependence on stable internet connectivity, and the challenge of recognizing regional dialects or accents. Despite these constraints, the study contributes both theoretical insights into elderly communication needs and practical implications for AI-powered tools, highlighting the potential of artificial intelligence to foster inclusivity, reduce isolation, and improve quality of life for older adults.

Keywords: Elderly communication barriers; Artificial intelligence-assisted language tools; Mental health and aging.

1. Introduction

In recent decades, most countries have undergone a rapid change in the age structure of their population. In 2010, 8.2% of China's population was aged 65+, and this is expected to surge by 2050, with up to 26.9% of the population being elderly. The aging trend is largely due to the one-child policy and increased life expectancy (Bao et al., 2022). In 2010, China had a fertility rate of 1.7 and life expectancy of 72 for men and 76 for women, compared to global averages of 2.5 and 67 for men and 71 for women, respectively (You & Henneberg, 2022). By 2050, China's elderly support ratio will dramatically decrease, from 9 working-age individuals per elderly person in 2010 to just 3, mirroring the challenges faced by countries like the US and Germany (Giles et al., 2018). This demographic shift will pose significant socio-economic challenges (Yu et al., 2025).

Mental health disorders, including dementia and depression, are significant but often overlooked issues among China's elderly population. Over 9 million elderly people in China are affected by dementia. The regional prevalence varies, ranging from 3.2% to 9.9%. In some areas, the incidence of mild cognitive impairment (MCI), which is considered a precursor to dementia, reaches as high as 25% (Wu et al., 2024). Risk factors such as smoking, heavy alcohol use, and depression exacerbate dementia, but many sufferers, particularly in rural areas, are not diagnosed or treated due to limited healthcare access (Xu et al., 2019). Caring for individuals with dementia poses significant physical, emotional, and financial challenges for families. This underscores the need for government subsidies and community or institutional support (Bifārìn et al., 2023). The cost of dementia care is exceedingly high, and with China's much larger elderly population, the financial burden could be several times greater than in countries like the US.

Depression is common among China's elderly, with over 39% reporting depressive symptoms. The rate increases to around 45% in the oldest-old group. This condition is often underdiagnosed and undertreated, partly due to the stigma surrounding mental illness. The lack of family support and poor health exacerbate depression, which negatively affects quality of life and increases the risk of death. With rapid socioeconomic change and the decline of traditional family structures, mental health issues in the elderly are becoming more widespread.

Socially, the impact of these mental health challenges is significant. The stigma surrounding mental illness in some areas, along with the lack of accessible mental health services, means that many elderly individuals do not receive the care they need. The burden on families to care for demented or depressed relatives adds considerable strain, both financially and emotionally. As the elderly population grows, there is a pressing need for increased public awareness of mental health issues, more medical resources for early detection and intervention, and greater family and community support. Social activities like playing mahjong or practicing Taichi have shown benefits for mental health, but more research is needed. Training more geriatric care professionals will also be crucial to meet the increasing demand for care.

2. Literature review

ICT solutions like Skype or mobile phones often create barriers for elderly people. The main reasons are low digital literacy, physical impairments, and the complexity of devices (Ahlin, 2018). Even when the technology connects families, elderly people often depend on younger relatives or friends for help. Poor internet connections and the high costs of technology further add to their struggles. Families sometimes have to experiment with different ICTs to stay in touch, which creates stress and frustration (Ahlin, 2018). AI-assisted communication tools offer a way forward. Voice-activated assistants and automated translation services can make communication simpler and more user-friendly (Rao & Verma, 2025). They also allow elderly users to complete simple tasks such as making calls through voice commands. In addition, AI tools can track health and alert families to potential issues (Kim et al., 2023). These functions make communication more reliable and adaptive. This paper investigates AI's potential in supporting elderly care, especially in transnational families. It first examines the communication barriers with ICTs, then designs an interface centered on simplicity and clarity. Features such as voice commands, translation tools, and simplified interfaces aim to make communication easier, even for elderly users with dementia or depression. Ultimately, the project aims to provide lessons for future AI communication tools and to create a more inclusive approach to elderly care in transnational families. By identifying the strengths and limitations of the AILATO system, the study aims to contribute to the ongoing improvement of AI technologies that address the unique communication needs of older adults, particularly in the face of rapid demographic aging and the decline of traditional family support structures. Ultimately, the research aspires to bridge the communication gap between elderly individuals and their families, leveraging AI to foster more inclusive and effective communication solutions that enhance intergenerational connectivity and support the mental and emotional well-being of the elderly.

3. Research design and Results

3.1 Pre-research

The target of the pre-research is to clarify the actual communication needs and challenges faced by elderly people in their daily lives, particularly in aspects like language expression, information exchange, and contextual adaptation. To better achieve our aims, we carried out an interview that would allow a more flexible answer on a subjective topic of being faced with communication and enable a better establishment of trust relationships compared with surveys, considering that information on this topic could relate to privacy, which would require trust between the interviewer and interviewee to share. In this interview, We have three major focuses. Firstly, we tried to

investigate the main pain points and difficulties elderly people encounter in communication in different scenarios (such as family, social, and medical settings). Secondly, we inquired the interviewees' personal experience and opinions/suggestions for the existing language learning or communication tools. Finally, we identified the interviewees' needs for a suitable communication assistance based on their cognitive changes by their age and social relationship network characteristics.

To ensure the representativeness of the interview while ensuring the effectiveness and validity of information, our interview used a combination of purposive sampling and snowball sampling. Purposive sampling makes each interviewee representative for their own group, which would allow analysis in depth. In China, trust relationships depend considerably on family and social networks. Combining snowball sampling provides a chance for a pre-interview trust relationship to form, increasing the likelihood for the interviewees to share the information in their daily life which could relate to personal privacy with the interviewer, creating a more reliable and direct pathway to information. To classify the sample by their living scenarios, 30% of the elderly live alone, 50% percent of the elderly live with family members, and 20% of them live in nursing homes. To classify the sample by their background, the sample includes the elderly from urban and rural areas, with various educational backgrounds. To become a member of the interviewees, we make sure that the interviewee possesses basic language expression abilities, without serious language or cognitive disorders, and is willing to participate in language learning or social activities and to share their personal communication experiences and issues.

The interview outline is designed based on clear research objectives while ensuring logical clarity and structure to ensure the interview content directly serves the research needs. The design process follows a goal-oriented approach, with questions focused on core objectives, starting from the participant's daily experiences and gradually guiding the conversation to in-depth exploration. The interview outline adopts a hierarchical design approach, beginning with general questions and gradually narrowing down to more specific ones. First, general questions like "What methods do you usually use to communicate with others?" help participants recall daily life scenarios. Then, more specific questions such as "When talking with your grandchildren, do you ever have trouble understanding their language?" focus the discussion on concrete situations. Finally, exploratory questions like "If you could design a communication assistant, what functions should it have?" encourage participants to express idealized needs and suggestions.

The interview process is carried out in three stages. In the preparation stage, an interview guide is developed, and interviewers are trained to use clear, simple language and maintain a friendly attitude. Participants are fully informed about the research purpose during recruitment to ensure informed consent. In the implementation stage, semi-structured interviews are conducted, each lasting approximately 40 minutes. The interview location is flexible, chosen based on the participant's preference (e.g., home or community center). The entire interview is recorded, and key points are noted, with the audio later transcribed into text. In the post-interview stage, the content is organized, and summary feedback is provided to some participants to verify that their views were accurately interpreted.

The survey reveals the main communication problems and needs elderly people face. These conclusions not only provide clear directions for product design but also lay a theoretical foundation for the development of each functional module.

a. Lack of Contextual Awareness (Corresponding to the Context Module)

Elderly people's communication performance in different contexts is significantly limited. In the survey, 70% of participants mentioned that they have difficulty adjusting their tone and wording in both formal settings (e.g., medical conversations) and informal ones (e.g., family chats). For example:

"When I go for a follow-up at the hospital, the doctor asks about my recent symptoms, and I always feel like I'm not explaining clearly. He probably thinks I'm confusing him. But when I talk to my child at home, I end up rambling, not knowing how to express myself." (Participant A)

Another participant discussed their confusion in intergenerational communication:

“My grandson always talks about things I don’t understand, like ‘metaverse’ or ‘AI’. I don’t even know where to start the conversation.” (Participant B)

Moreover, cultural factors further exacerbate the difficulty in adapting to different contexts. Many elderly people struggle to balance traditional expression methods with modern communication habits. These issues suggest that contextual training should be a focus in product design, helping users enhance their ability to judge different situations and adapt to diverse communication needs through simulated real-life dialogues and personalized feedback.

b. Insufficient Information Expression Ability (Corresponding to the Message Module)

In terms of information transmission, elderly people generally show tendencies of vague or incomplete expression. For example:

“Sometimes when I’m talking to my neighbor, I get halfway through, and they can’t follow. It’s not that they’re impatient, but I feel like I forgot to explain the key point.” (Participant C)

Another participant added:

“When I talk to my child about our retirement plan, I explain in great detail, but later, my child says he didn’t understand the point I was trying to make. He thinks I went around in circles and didn’t get to the main point.” (Participant D)

More than half of the participants mentioned that when describing complex issues, they tend to speak at length, leading to inefficient communication. Weak grammar and lack of confidence in language logic exacerbate this problem, especially in situations where clear communication is necessary (e.g., medical consultations or financial matters). The product should help users simplify their expressions through training in grammar and sentence structure, and design a supplementary information module to prompt users to add details when needed, ensuring the completeness and clarity of the communication.

c. Difficulty Adapting to Diversified Communication Channels (Corresponding to the Channel Module)

With the diversification of communication media, elderly people show weaker adaptability to different communication channels. One participant mentioned:

“I’m more used to making phone calls because I can hear the tone and voice, but my child prefers messaging. I type slowly, and sometimes I don’t know how to use emojis.” (Participant E)

Another participant discussed difficulties with video calls:

“When I video chat with my old friends, I always feel like I don’t know how to start the conversation. When facing the screen, I feel like I can’t say anything.” (Participant F)

Some participants also mentioned a lack of understanding of “digital etiquette” when communicating via text or social media, such as response time, tone, etc. These challenges indicate that the product should integrate a multi-channel adaptation module, providing actual simulations of communication media, helping users easily switch between voice, text, and video, while also mastering digital communication norms.

d. significant barrier to elderly communication is the lack of language rules and vocabulary. On(Corresponding to the Code Module)

e participant said:

“understand the terms like ‘economic recovery’ and ‘digital transformation’ from the news, but when I try to talk to my friends about it, I feel like I can’t express myself.” (Participant G). other participant mentioned the challenge of complex sentence structures:

“ometimes when I write letters or fill out forms, I feel like my grammar is wrong when I use long sentences, and simple sentences feel like I’m not expressing myself well.” (Participant H)

The survey found that more than half of the participants said they lacked enough vocabulary to clearly express their ideas in specific situations, especially in formal expressions (e.g., applications, complaints). This limitation affects their communication effectiveness and participation. Product design should focus on high-frequency vocabulary training and practical sentence structure teaching, combined with contextualized application scenarios, helping users gradually master complex sentence structures and professional vocabulary, and reinforcing these skills in actual conversations.

3.2 Product design

The foundation of this product is ChatGPT's customization feature. By using prompts in different sections, we can shape the interface to act as an elderly conversation assistant. From our primary research, we identified key needs and designed several models across four areas. These areas—context, message, channel, and code—come from Roman Jakobson's (1960) framework of communication. These categories come from Roman Jakobson's 1960 essay on communication. To ensure effective use, the assistant applies repetition.

Area 1: Context

Understanding context is essential to effective communication. This area focuses on helping users develop an awareness of how the surrounding situation, relationship, and social or cultural factors influence the way we speak and interact with others. Users will be introduced to real-life communication scenarios—such as a conversation between a parent and a teenager about online behavior, or a discussion between colleagues from different cultural backgrounds—highlighting how tone, vocabulary, and message structure shift based on who you're talking to. To support learning, GPT provides modeled dialogues that reflect these situational nuances. After seeing examples, users practice by joining a dialogue. They try to copy the tone, word choice, and intent they observed. Next, they look at major news stories. GPT shows how age and background shape reactions. For example, young audiences may welcome a tech update, while older people may worry about privacy. The user then role-plays a talk with someone of a set age and relationship, such as a niece or an old friend. This helps them learn how to adjust their words for respect and relevance. Together, these tasks build skill in real-world communication.

Area 2: Message

This section focuses on how to build clear and complete messages. Users begin with basic grammar, learning the roles of subject, verb, and object. Training starts with basic grammar: subject, verb, and object. This base supports later lessons on longer sentences. Users compare examples and practice rewriting them in a clearer way. For example, "Although she was feeling unwell, she completed the project before the deadline" can be simplified to "She didn't feel well, but she still finished the project on time." Such simplification keeps language clear and natural. Another skill is adding missing details. A short line like "He called yesterday" needs more context. Learners must expand it with who was called, why, and what happened. With steady correction, users grow used to shaping their thoughts into clear, informative statements. By practicing both simplifying and expanding, they gain the ability to write with precision and depth.

Area 3: Channel

This section focuses on helping people build and maintain meaningful communication in daily life. Many people, especially older adults, may hesitate to reach out after long gaps. The Contact Assistant offers reminders like, "You haven't talked to your daughter in a while. Maybe ask about her job." Emotional tips remind users that even small notes—like "Thinking of you"—can mean a lot. For users less familiar with modern tools, the New Technologies Guide provides step-by-step tutorials on WhatsApp, Zoom, or speech-to-text. By combining encouragement with practical training, this section helps users stay connected without stress.

Area 4: Code

Today's communication, especially with younger generations, is often infused with buzzwords, emojis, slang, and internet references. This area helps users become familiar with this fast-evolving "code" of modern language so they can better understand and engage in conversations across age groups. One activity is the Buzzword Dictionary, which introduces trending words and phrases such as "ghosting" (suddenly stopping communication without explanation) or "on fleek" (perfectly styled or executed), along with real-life example sentences. Users will learn when and how such expressions

are used, and—just as important—when they might be inappropriate. To strengthen recall, users will also work with Buzzword Flashcards, digital tools that display a buzzword on the front and its meaning and usage on the back. These flashcards are designed for short daily review and help users solidify new vocabulary in a fun, non-pressured way. The most interactive element in this area is the Simulation Dialogue with the Young, where GPT acts like a younger person chatting informally. For example, GPT might start a conversation by saying, “Yo, did you catch that new Marvel trailer? It’s straight-up fire!” The user responds using newly learned buzzwords, and GPT gives feedback on the naturalness and appropriateness of the reply. If the response feels too formal or outdated, GPT will gently suggest more current phrasing. These dialogues not only teach language but also foster empathy and confidence in social interactions with younger people. Over time, users will find themselves feeling more connected, relevant, and comfortable joining conversations in a modern, relatable way.

4. Conclusion and Discussion

Despite the tempting benefits the AILATO system could possibly bring, several limitations must be acknowledged.

First, elderly users often face difficulties in engaging with highly flexible and interactive AI assistants due to limited imaginative capacity and adaptability. When confronted with open-ended, dynamic interactions, some older adults may feel uncertain or overwhelmed, which in turn reduces confidence and willingness to continue using the system. This highlights a psychological and cognitive barrier rather than a purely technical one. To overcome this challenge, the system could be supplemented with a detailed and user-friendly manual written in simple language. In addition, at the beginning of each interaction, the AI could provide brief, structured prompts or guiding suggestions that orient the user and create a sense of familiarity. This would help to reduce anxiety and enable elderly users to navigate the AI’s flexibility with greater ease.

Second, the interface is still limited by cost and platform. Right now, it relies mainly on text, which is hard for older adults with low literacy or poor eyesight. Without multimodal support, the system feels less engaging. Improvements should include graphic icons, color codes, and step markers. A stronger interface could add clear symbols, colors, and progress cues. Vibration alerts and audio cues could also make it easier to use. Adding haptic and audio feedback could improve accessibility. Third, stable internet is another barrier, especially in rural China where infrastructure remains underdeveloped. Reliable internet is lacking in many rural areas. For elderly users there, always-online services are not realistic. A local solution is needed. For example, the system could store offline knowledge and cached Q&A, so basic support still works without the internet. Offline storage and cached answers would allow the system to function even without the internet. This would make the system more inclusive and reliable. Such features would ensure that basic communication support remains available to users in low-resource environments, thus increasing the robustness and reach of the system. Finally, speech recognition struggles with dialects. Many elderly users rely on local speech patterns, which are poorly handled by current systems. Many seniors do not use standard Mandarin, and current tools often cannot handle this variety. Dialects and accents used by older adults often confuse current technology. Misrecognition not only disrupts communication but may also discourage continued use of the system. To address this issue, the system could implement an initialization stage during onboarding, where users are prompted to read aloud a set of predetermined keywords or sentences. This process would allow the AI to collect a personalized voice sample, thereby improving recognition accuracy across different dialects and accents. Continuous refinement through user feedback and periodic retraining of models on localized datasets would further enhance linguistic inclusivity.

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