

Understanding Older Adults Use of Audio Reminder Technology

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Figure 1: Older adult happily using audio technology.

Abstract

In this project we aim to understand the wants, needs, and preferences of older adults in the realm of audio reminder technology. To do this, we conducted five 30-45 minute interviews with older adults, learning about their daily morning routines as well as introducing them to two audio reminder devices, Rosie 2.0 and Alexa, and asking them their thoughts and opinions on the two. Our aim was to learn of their needs and preferences for future development of devices that best reflect the users' desires. This should lead to increased usefulness and accessibility for older adults in the technological world. We wanted to focus on older adults with mild to moderate cognitive decline, as this demographic is more likely to require assistive reminder technology. We expected to see that older adults wanted simple technology that they could easily operate. As we interviewed participants we saw that this was not necessarily the case. The biggest factor was not complexity but rather trust in technology.

CCS Concepts

- Human-centered computing → Accessibility technologies; HCI theory, concepts and models; Sound-based input / output; Interaction design theory, concepts and paradigms.

Keywords

Older adults, Reminder technology, Assistive technology, Routines, Qualitative research

1 Introduction

Many older adults experience issues with memory. As a result, many older adults require around-the-clock care. Losing autonomy like this through age can be extremely discouraging, making them feel like a burden and decreasing their quality of life. Around 40% to 47% of Americans aged 65 or older report having memory impairment [1]. Additionally, around one in ten Americans aged 65 or older have dementia, a form of cognitive impairment [6]. Cognitive impairments directly affect quality of life. It can cause depression, impairments in instrumental activities of daily living (IADLs), and affect social relationships for older adults [10]. IADLs are activities necessary for independent living, including medication management, meal preparation, and remembering appointments [9].

Advanced technology has the potential to offer older adults their personal autonomy back to improve quality of life. Various reminder technologies, such as audio reminder programs, can help make daily tasks easier to complete. However, technology is constantly advancing, and many older adults are unable to keep up with the new changes. The goal of this project is to understand the wants,

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needs, and preferences of older adults in the realm of audio reminder technologies.

2 Related Work

This section discusses prior work to establish a foundation for our study and to highlight gaps in understanding what older adults, especially those with cognitive decline, need and want in audio reminder technology. We begin by discussing existing reminder technology for older adults, then examining research on technology adoption in older adults to gain an understanding of the factors known to influence older adults' use of technology.

2.1 Research on Reminder Technology for Older Adults

Older adults with cognitive impairments often experience memory problems. This can negatively affect their ability to complete instrumental activities of daily living, increasing their dependence on others and therefore decreasing their autonomy. Existing research has found that older adults are receptive to assistive technology to support their memory, such as reminding them what actions they need to do at certain times. Examples of these actions include taking medication, preparing and consuming meals, and going to appointments [11]. Additional benefits of reminder technology include increased social engagement, decreased loneliness, and increased health-related quality of life [3].

2.1.1 Types of Reminder Technology for Older Adults. Many forms of assistive technology exist for older adults including tablets, smart speakers, apps, and wearables such as smartwatches [2–4]. In one study, older adults were found to have positive attitudes towards assistive technology in general, with a strong preference for mobile apps and voice-activated assistants over smartwatches [8]. The study also found that older adults were equally interested in and willing to use mobile apps and smart speakers, but expressed privacy concerns for voice-activated assistants [8]. Studies have highlighted the benefits of smart speakers for the well-being and quality of life of older adults, including helping with medication reminders, controlling lights, and listening to music [2].

2.1.2 Limitations in Reminder Technology for Older Adults. While there exist many forms of reminder technology for older adults, research on their real-world adoption and usage remains limited, therefore the extent of their practical benefits are unclear. For instance, there are limited studies focusing on older adults' experience with smart speakers even though smart speakers have become an integral part of households [2]. Studies emphasize the importance of easy integration of smart speakers into older adults' daily routines but further research is needed to understand what this integration looks like [2].

2.2 Technology Adoption Among Older Adults

Despite the benefits of assistive technology, technology adoption remains a challenge among older adults. Many older adults are unwilling or unable to learn how to operate complex devices due to various individual, social, and technological factors [5, 12]. At the individual level, characteristics such as education, income, and willingness to learn can shape a person's comfort with adopting

new technologies. Technological factors such as cost, perceived usefulness, and perceived ease of use also play a critical role in the adoption of technology in older adults. Additionally, social factors, including the social construction of aging, influence from family and peers, and overall trust in technology, further shape older adults' engagement with technology.

Many models exist to simulate the relationships affecting technology use. The earliest widely cited model is the Technology Acceptance Model (TAM), which says that technology use is influenced by the individual's motivation to use technology, which depends on the perceived usefulness and usability and overall attitude towards using the technology [7]. Perceived usefulness, perceived usability, facilitating conditions, and social influences are the 4 common predictors for technology adoption among various technology acceptance models [7]. Willingness to adopt and use technology, health barriers such as cognitive impairments, and cost are other factors that influence technology adoption among older adults [3].

2.2.1 Confidence in Learning Technology. Older adults who are less confident in learning new technology are also less willing to adopt the technology. Moxley et. al. found that higher education level, higher cognitive abilities, and lower perceived need of assistance to learn technology are all associated with higher confidence among older adults [7]. These findings highlight the need for clear instructions on operating technology so older adults will be more confident using technology and be more likely to adopt the technology.

3 Methods

3.1 Study Design

Our first step in gaining understanding of older adults' use of reminder technology was deciding the scope of our project. We decided to focus on the morning routine. We decided this because we wanted to keep a narrow scope for the benefit of the participants. Since we wanted to focus on older adults with mild cognitive decline, we wanted to avoid overwhelming them. We decided on the morning routine because it is generally a constant in many people's lives. This time of day typically also consists of important daily routines, such as taking medication and planning the rest of their day.

Once we decided the scope of our project, we chose to pursue an understanding project. We wanted to gain understanding of what older adults want directly from the source. Therefore, we decided to conduct interviews with older adults. We conducted five interviews, each lasting around 30-45 minutes, primarily with older adults experiencing mild to moderate cognitive decline. We obtained IRB certification to ensure our study was conducted ethically.

3.1.1 Interview Script. An important part of our understanding study was developing the interview script. Initially, we planned to ask our participants about their opinions on general features in technology to see what they may like and dislike. As we were discussing questions to ask, a trusted source provided feedback that many older adults are not familiar with current technologies and may not know what features they like or don't like. Therefore, simply asking participants "what do you want?" may not yield helpful results. We realized that we had to show participants options so they could form opinions on technology they may not have been

aware of. As a result, we decided to research existing reminder technology options to show our participants. We had various criteria for these devices:

- **Audio Reminder:** The devices must have audio reminder features, though they were not limited to those features alone
- **Accessible websites:** They must have websites that are easy to navigate and understand, as well as containing videos of examples of use of the technology to show participants
- **Variety:** We wanted to see technologies with different interfaces, purposes, audiences, etc.

Once we decided which devices to use, we developed a script. Our script started with questions about the participants daily lives. We did this for two reasons. The first reason was to see what needs the participant would have. We wanted to gauge which of their daily tasks the participants may want more assistance with so we could focus on specific features. The second reason was we wanted our participants to start answering easy questions that they felt comfortable talking about. Older adults with less technology experience may feel disinclined to discussing something they are not comfortable with, so we hoped starting with a more familiar topic would allow them to open up to us.

Additionally, we decided not to record the interview, neither audio nor visual. We figured that our participants would feel more comfortable talking and opening up if they were not recorded. We wanted to create a conversation-like feel to the interviews, allowing the participants to speak freely without fear of misspeaking.

3.2 Materials and Procedure

We decided to use the two devices Rosie 2.0 and Alexa. Images from their websites can be seen in Figure 2.

3.2.1 Rosie 2.0. is a voice-activated, audio reminder digital alarm clock that was created for older adults with memory loss. The design is very simple, with large, high contrast numbers showing the time with a classic digital alarm clock look. Personalized recorded messages can be input, allowing for a more intimate experience with the user. The device does not require WiFi and is corded with a battery backup.

3.2.2 Alexa. is an AI-powered voice-activate personal assistant. Alexa is designed as a simple speaker with minimal buttons, meant to be perceived in an audio medium. It responds to a large variety of requests, extending past reminders to telling the weather, offering companionship, answering trivia questions, and more. The audience extends past older adults to the general public. Both of these devices have websites with videos of their operation and use, as well as descriptions and photos of the devices.

We met with our participants in their places of residence to ensure they felt comfortable and at home, so we could get a better understanding of their routines and needs. Upon meeting our participants, we greeted them and introduced ourselves. We then gave them copies of our consent form and walked them through the form, ensuring they understood what they were consenting to. Each of our participants agreed and signed. Next, we started with questions about their daily morning routine to gain knowledge of

them and their daily needs. Some questions included, but are not limited to:

- Could you please walk us through your morning routine?
- Do you have any methods to help you remember your routine?
- Do you require assistance with your morning routine?
- Do you have regular use/access to electronic devices?

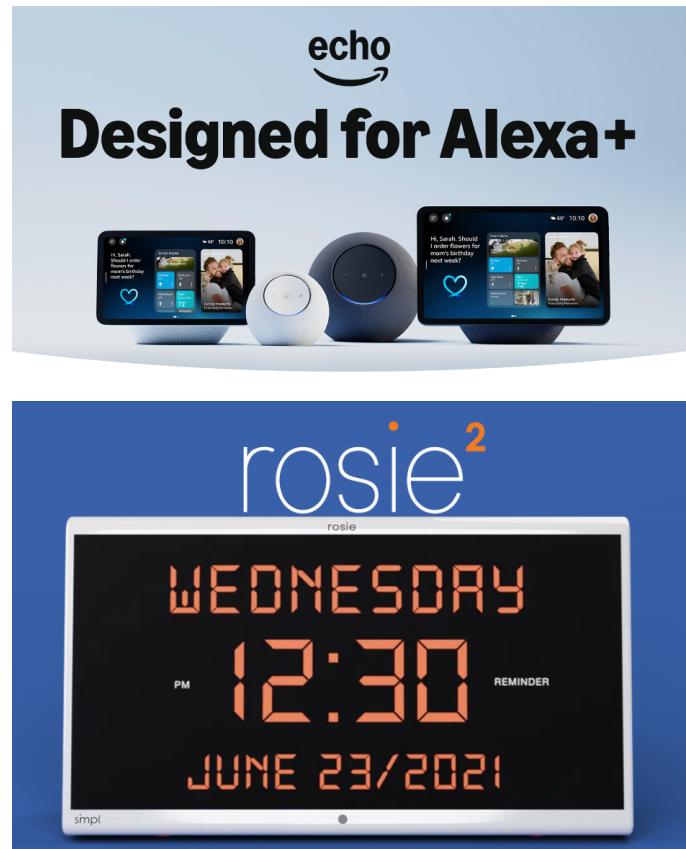


Figure 2: Image of Alexa and Rosie 2.0 devices from their company websites, showing the design of the devices.

Once the preliminary questions were answered, we moved on to discuss the devices Rosie 2.0 and Alexa. First, we introduced Rosie 2.0, describing its purpose, target audience, and general design. Next, we walked the participants through the website for Rosie 2.0, which included watching videos of example use cases. Finally, we asked participants if they had any questions before diving into some more interview questions including, but not limited to:

- What do you like about Rosie 2.0?
- What do you not like about it?
- Would you trust this device?
- Do you think the design seems intuitive? Do you think it would be easy to use?

We then repeated this process with Alexa. Once we finished with Alexa, we asked a series of questions regarding both devices, including, but not limited to:

- Which interface do you prefer? Why? Which one is more visually appealing to you?
- Which would you be more likely to use? Why?
- Do you like having more advanced features, or would you rather a more simple option?

Once we finished the questions, we thanked our participant and reminded them to feel free to reach out to us with any questions.

3.3 Participants

We decided to restrict our participants to older adults of age 75 and older. We wanted to find older adults that may be experiencing mild to moderate cognitive decline. We wanted to find a variety of gender and background.

Finding the participants was somewhat of a struggle for us. We contacted multiple retirement homes, but found none willing to connect us to their residents. As a result, we had to rely on personal connections to find participants. Because we were relying on personal connections, it was not possible to ensure mild to moderate cognitive decline. As a result, two of our participants have no cognitive decline.

As shown in Table 1, we had 5 participants, ranging in age from 75 - 91. We had a variety of nationalities. We had 2 female and 3 male participants. Their cognitive state ranged from no cognitive decline to moderate cognitive decline.

Table 1: Participant Demographics

Participant ID	Gender	Age	Nationality	Cognitive Decline
P1	Female	91	Venezuelan	None
P2	Male	85	French	Moderate
P3	Male	75	Chinese	Mild
P4	Female	81	Venezuelan	Mild
P5	Male	78	American	None

4 Discussion

In this study, we explored the attitudes and preferences of older adults toward audio reminder technology. We found that individual, technological, and social factors play a role in older adults' decision to use audio reminder technology, with some having greater influence than others.

We found that individual factors, including familiarity with technology, such as cell phones, and openness to audio-based technology, have some influence on older adults' attitude towards audio reminder devices. Social and technological factors have a greater influence on their attitude. The social factor that greatly influences their decision is trust in said technology. Technological factors, such as perceived usefulness and ease of use, also had an impact on their attitude.

4.1 Current Technology Use

Our participants had varying levels of experience using technology, specifically cell phones. Among our participants, two were comfortable with and used their cell phone frequently, one was comfortable with and used their cell phone infrequently, one could

only use simple features on a cell phone, such as navigating the calendar app, and one struggled with cell phone use and avoids using it as shown in Figure 3. The main usage of cell phones among our participants was for calling and communication. Other features our participants used on their cell phones were texting friends and family, using the clock app, checking the weather, and using social media.

We found that the three participants who were comfortable using their cell phones thought Rosie 2.0 and Alexa have intuitive designs and are easy to use. The participant who could use basic cell phone features found Rosie 2.0 easy to understand but struggled with Alexa's more complicated design. The participant who did not know how to use a cell phone found Rosie 2.0 and Alexa's design difficult to understand. These findings suggest that older adults who have experience using technology, such as cell phones, are more open to learning about and becoming comfortable with newer and different technology.

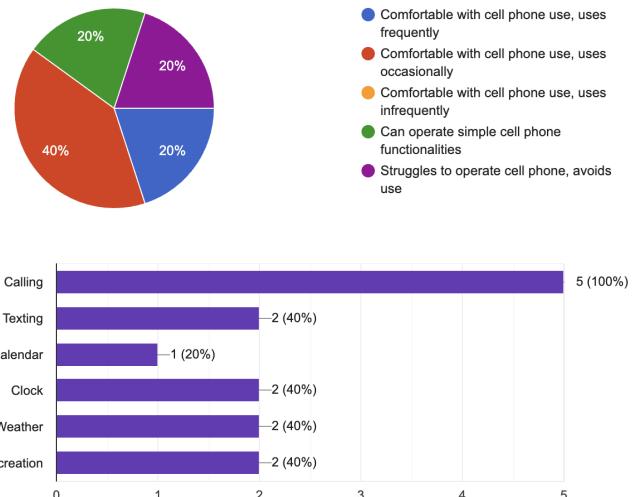


Figure 3: Above, a pie chart representing the aptness and frequency of cell phone use of participants. Below, a bar graph representing the participants uses of cell phone.

4.2 Complexity

Rosie 2.0 has simple features tailored towards audio reminding for older adults, while Alexa has much more advanced features extending past reminding. We found that our participants had different views on having simple or advanced features for an audio reminding technology as shown in Figure 4. Two participants expressed a desire for advanced features, such as being able to "talk" to the technology like one can talk to Alexa. Two participants preferred simple features over advanced features, saying advanced features make the technology "too complicated" as seen in Figure 4. One participant wanted technology with advanced features while maintaining a simple and easy to use design.

Complexity
 <p>"I'll always pick something more advanced. Something that thinks, innovation thinks, you should never move backwards" - P1</p> <p>"I like more simple things. When it's too advanced it's too complicated" - P2</p> <p>"I want something that is simple, easy to use, but with advanced features" - P3</p>

Figure 4: Significant quotes from participants that highlight the issue of complexity in technology.

4.3 Trust

We found that a lack of trust in technology is the main reason why older adults are less inclined to use audio reminder technology. Four participants expressed distrust in technology to protect their private information. As shown in Figure 5, participants were concerned that the technology is always listening even when they don't want it to, which they perceived as an invasion of privacy. Surprisingly, one participant did not trust the technology, not due to privacy concerns, but instead due to reliability concerns. They were worried that the technology might suddenly stop working due to issues such as a dead battery. As a result of this lack of trust, participants indicated they were highly unlikely to buy Rosie 2.0 or Alexa. This finding highlights that trust is a significant barrier to audio reminder technology adoption among older adults.

Trust
 <p>"I have an Alexa, but I put it in a closet because I did not trust it, so I do not use it" - P1</p> <p>"Big brother is listening. I trust it to tell me information, I don't trust it to keep my information private." - P5</p>

Figure 5: Significant quotes from participants that highlight the issue of trust in technology.

4.4 Shared Dissatisfaction

There was a shared dissatisfaction towards Rosie 2.0 and Alexa among the participants. We found that none of the participants would consider buying or using Rosie 2.0 or Alexa due to individual, technological, and social factors. Our study highlights that current audio reminder technology does not adequately meet the needs of older adults, emphasizing the importance of understanding their preferences when designing these systems.

4.5 Limitations

4.5.1 Participants. Due to our trouble obtaining participants for the study and needing to utilize personal connections, our demographic scope is highly limited. Although we have a range of gender, age, and nationality, we lack a range in socioeconomic factors, a major component in technology use and adoption.

4.5.2 Materials. We lacked the physical technology to show participants. It is probable that we could have obtained an Alexa, however it would have been far more difficult to access a Rosie 2.0, so we decided to forego the use of physical technology so both devices could be evaluated and compared fairly and equally. However, the interviews likely would have yielded stronger results if the participants were able to experiment with the devices and we could have conducted a contextual inquiry.

4.6 Future Steps

Future steps would include interviewing more participants, expanding to different socioeconomic ranges and other demographic factors. This would gain insight to a wider range of older adults. Additionally, in future steps, it would be beneficial to obtain an Alexa and Rosie 2.0 and conduct contextual inquiries in addition to the interviews to yield stronger results.

5 Conclusion

When starting this project, we expected to see that older adults preferred Rosie 2.0, a simpler design and use. We figured that a simpler design would encourage them to feel safe using it. We assumed that Alexa would be overly confusing and the lack of a visual interface would discourage the older adults. We learned that this was not the general opinion. The participants ranged from strongly preferring Rosie 2.0 for its simple design to strongly preferring Alexa for its versatility and multi-faceted uses. The leading factor was not complexity, but rather trust. Each participant questioned how much they could trust both devices. Each participant feared that the device would listen to their daily conversation or that the device would randomly shut down, lose battery, or lose functionality, which would cause them to miss important reminders that they rely on.

The main takeaway from this project is that when designing technology for older adults, it is important to have minimally invasive features. A device that can play audio but does not include an audio-listening feature could help alleviate privacy concerns among older adults. While removing the audio-listening capability would reduce the product's complexity, it could also increase usage, since older adults would feel safer and more confident using it.

6 Reflection

We learned a lot from running this study. We learned how to adapt to our audience. When creating our interview script, we learned that participants may not have the same knowledge base as the interviewer, requiring the interviewer to meet the participant where they are in order to gain the best responses. In this aspect, we learned to step in the shoes of our interviewees a little bit more.

This project taught us not to homogenize a population. Older adults are a vast and wide population with different wants and

needs within themselves, and assuming all, or most, older adults would want less complex technology is simply incorrect.

This project taught us that obtaining participants can be very difficult. We learned to improvise for this particular project, but in future studies we will have to find a better way to obtain participants for our study.

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