UNEC Journal of Computer Science and Digital Technologies
Volume 2, № 1, 2026, pp. 34-55
https://doi.org/10.30546/UNECCSDT.2026.001.276

Section:
Human–Computer Interaction &
Digital Education Technologies

Barriers to Voice Assistants for Older Adults: Uses and Gratifications Perspective

Ayser Şafak Tuncer[1*], Sezin Eşfer[2]
[1] Faculty of Educational Science, Bahcesehir University, Istanbul, Türkiye*
[1]0009-0008-8490-626X, aysersafak.atuk@bahcesehir.edu.tr
[2]0000-0001-9095-6855, sesfer@gmail.com

Abstract

This study examines how adults aged 60 and over interact with voice assistant technologies, drawing on the Uses and Gratifications (UGT) framework to understand their motivations, expectations, and both the cognitive and communicative barriers they encounter. Employing a qualitative single-case study design, the research involved five older adults (aged 60–75) with diverse demographic and technological backgrounds. Data were collected through semi-structured interviews, scenario-based usability tasks, structured observations, and reflective notes, in line with the depth-oriented goals of qualitative inquiry. Findings indicate that older adults perceive voice assistants as potentially useful tools for managing daily tasks such as reminders, information seeking, and communication; however, actual interactions often increased rather than reduced cognitive load. Despite perceived benefits, adoption was limited by privacy concerns, difficulty formulating commands, distrust of the system's accuracy, and a general sense of technological complexity. Scenario-based tasks increased participants' awareness of the technology's capabilities, yet also surfaced challenges including speech recognition errors, difficulty interpreting system responses, and command formulation problems, all of which heightened cognitive effort and reduced overall satisfaction, particularly among participants with limited prior digital experience. The study highlights the dual nature of voice assistants: they can enhance independence, confidence, and social connectedness, but they may also introduce unexpected demands that complicate the user's experience. These results underscore the importance of designing voice-based Artificial Intelligence (AI) systems that are sensitive to the sensory, cognitive, and communicative needs of older adults. Through the UGT lens, four core gratifications were identified: information access, self-efficacy and personal identity reinforcement, social integration, and entertainment or escape, though the degree to which these were fulfilled varied considerably across scenarios and participants. The study makes a contextual contribution by demonstrating how age-related usability barriers are compounded by language- and culture-specific recognition difficulties in a Turkish-speaking older adult population. Findings offer evidence-based recommendations for the design of age-friendly, linguistically inclusive voice AI systems and for digital inclusion policies targeting older adults.

***Keywords*:** Voice assistants, Uses and Gratifications Theory, Human-AI Interaction, Older Adults

Received:	*Revised:*	*Accepted:*	*Published:*
15/05/2026	*25 /05 /2026*	*05/06/2026*	*17/06/2026*

1. Introduction

As global populations age at an unprecedented pace, the role of digital technologies in supporting the quality of life for older adults has become a central concern in interdisciplinary research. Moving beyond traditional inquiries into user gratifications, contemporary discourse

now critically examines why older adults frequently reject voice assistants. Rather than viewing this non-adoption merely as a functional failure or technological aversion, it should be recognized as a deliberate, strategic exercise of agency aimed at maintaining independence and cognitive self-competence [1]. Against the backdrop of escalating care needs, digital health technology adoption has gained considerable momentum, particularly following the shifts in older adults' attitudes and usage behaviours documented in the wake of the COVID-19 pandemic. Recent research demonstrates that voice assistant technologies can serve as effective tools for helping older adults navigate functional and communicative barriers in daily life [2, 3]. These point to the need for user-friendly, age-sensitive solutions that lower barriers to digital participation among older populations.

Voice assistants are AI-driven systems that utilize natural language processing to interpret and execute spoken commands, allowing users to access information, manage tasks, and engage with connected services without the need for physical interaction. By providing hands-free control and intuitive human-computer interaction, these technologies offer a significant approach to addressing the challenges associated with an aging population [45]. Their hands-free and eyes-free interaction modalities make these technologies particularly accessible for older adults who experience difficulties with traditional physical interfaces [3]. Research indicates that usability and emotional needs are key determinants of older adults' attitudes toward voice assistants, with perceived ease of use, security, enjoyment, and sense of companionship found to influence acceptance and usage intentions [4]. Moreover, voice assistants have been shown to yield both psychosocial and functional benefits, including reduction of loneliness, enhancement of social support, and facilitation of safe mobility [5]. However, the extent to which voice assistants improve older adults' quality of life depends on how these technologies are perceived, how they are learned, and the motivations that drive their use [6]. Technology participation extends beyond physical access to encompass cognitive, affective, and communicative dimensions, particularly among populations with functional limitations [7]. Therefore, older adults' interaction processes with voice assistants must be addressed through a multidimensional approach. A recent scholarship on conversational agents and older users further highlights the need to examine dialogue repair strategies, system integration challenges, and emerging health support applications of AI-based voice interfaces [8]. This research investigates the usage of motivations, experiential gratifications, and communicative barriers of individuals aged 60 and over engaging with voice assistant technologies, analyzed within the framework of Uses and Gratifications Theory (UGT).

1.1. Voice Assistant Technologies and Adults Aged 60+

In the contemporary era where technological developments shape human life, the emergence and proliferation of voice assistant technologies has constituted one of the most remarkable phenomena of digital transformation. Prominent applications such as Apple's Siri, Google Assistant, Amazon's Alexa, and Microsoft's Cortana have substantially transformed the nature of human-machine interaction, shifting it from input-based interfaces toward naturalistic spoken dialogue [10]. Unlike the structure of traditional human-computer interaction, which relies on physical and visual interfaces such as keyboards, mice, or touchscreens, voice assistants offer an intuitive communication model based on natural conversational language. This technological revolution creates significant opportunities, particularly for older adults who encounter difficulties in interacting with traditional user interfaces [10]. When considering the barriers that physical and cognitive changes accompanying the aging process create in technology use, the potential offered by voice interfaces becomes even more pronounced [11]. This section addresses the conceptual framework of voice assistant technologies, their historical development process, fundamental technical components, and application areas.

Voice assistants offer meaningful support to older adults in health management through features such as medication reminders, appointment scheduling, and responses to basic health queries, all of which facilitate self-monitoring of health conditions [3, 9]. In addition, voice-

activated emergency call features hold particular importance for older adults living alone or managing chronic health conditions [10, 11]. The problem of social isolation, which is prevalent in old age, constitutes one of the important application areas of voice assistants. These technologies can facilitate older adults' communication with family members, provide access to entertainment such as music and news broadcasts, and even offer a degree of social companionship [5, 10].

Voice assistants are used as an important tool in organizing older adults' daily living activities. Functions such as calendar management, creating shopping lists, obtaining weather information, listening to news, and answering various questions support older adults' cognitive capacities [11]. The proactive reminder features offered by this technology are particularly valuable for older adults experiencing memory problems. Furthermore, simplicity of use and adaptability to individual needs are consistently identified as primary expectations among older adults evaluating digital products [4]. The fact that voice assistants are characterized in a manner that can directly meet these demands indicates a theoretically high potential for widespread adoption among the older population. The inadequacy of user manuals and learning difficulties lay the groundwork for the proliferation of voice-guidance-based solutions as tools offering not only entertainment but also education and daily life support [15]. Despite these affordances, significant barriers remain. Speech recognition systems often struggle with older adults' speech patterns, which may include slower speech rates, regional accents, and age-related vocal changes such as reduced volume or altered articulation. System onboarding and initial setup friction also constitute underexamined obstacles to adoption, particularly for individuals with limited digital literacy. Furthermore, emerging LLM-powered voice assistants introduce new possibilities for natural, context-sensitive health dialogue, yet also raise novel concerns regarding information accuracy and over-reliance [1].

1.2. Uses and Gratifications Theory

The origins of Uses and Gratifications Theory (UGT) lie in communication studies, with foundational contributions tracing back to the mid-twentieth century [14]. At the core of the theory are the concepts of "use" and "gratification": use refers to the process by which individuals actively select and engage with media content, while gratification refers to the satisfaction derived from that engagement. Use refers to the process by which individuals select and consume media content, while gratification refers to the sense of satisfaction obtained as a result of this process. The context of this theory concerns why and how individuals consciously choose and use mass communication tools to meet their specific needs [16]. This section focuses on an overview of uses and gratifications theory, its motivational dimensions, and the theory in the context of voice assistant technology for older users.

UGT was among the first theoretical frameworks in communication research to position audience members not as passive recipients of media content but as active agents who deliberately select media to fulfill specific needs and expectations [14, 17]. In this context, individuals are defined not merely as passive receivers of media content, but as "active gratification seekers" who enter into an interaction process with media to meet their expectations and needs. People consider their own motivations and needs in media preferences and make goal-oriented choices accordingly [17].

The concept of gratification extends beyond individual-level psychological satisfaction to encompass broader social processes, including identity formation, normative adaptation, and the negotiation of social roles through media engagement [14, 16]. This concept is not limited to psychological relief or fulfillment of information needs at the individual level; it also encompasses more comprehensive social processes such as identity formation, adaptation to social norms, or developing a stance against these norms. Therefore, the effect of gratification on the individual is not limited to individual experience but can also produce indirect consequences on the social environment and status.The origin of the concept of gratification is based on individuals' tendencies to meet various psychological, cognitive, and social needs

during the media use process. Among these needs are different motivations such as access to information, entertainment, socialization, gaining status, and escaping from the pressures of everyday life. These motivations play a guiding role in individuals' selection of specific media content; the gratification obtained from content determines the nature of the relationship established with media [16].

As a result of the media use process, individuals experience certain gratifications. Gratifications sought encompass the benefits and motivations that individuals expect to achieve through media. Active audiences tend to prefer media they believe will meet their expectations, and this is viewed as an important determinant of media usage intention [18]. For example, while one user may select a media tool solely to meet entertainment needs, another may make choices for the purpose of obtaining information or following the agenda. Furthermore, gratifications obtained refer to the benefits that individuals can actually achieve as a result of media use. In this case, the consumer decides whether to use the same media again by considering the gratifications obtained from past experiences [19]. Initial studies on uses and gratifications theory were conducted within the framework of traditional media tools, and over time the research field expanded with the development of the internet and digital technologies. Today, this approach is applied in different contexts ranging from the reasons for using food delivery applications to the adoption of chatbots and online or in-store technologies [17,18, 20].

Applied to older adult populations specifically, research suggests that technology attitudes are closely shaped by individual motivations and social context [5], making UGT a particularly appropriate lens for examining voice assistant adoption in this group. According to UGT, users as active individuals select media content to meet their own needs and obtain different types of gratification as a result of these choices. Particularly when older adults are concerned, the use of voice assistant technologies can provide various gratifications such as obtaining information, entertainment, establishing social interaction, and facilitating daily living activities [12]. In this context, how voice assistant technologies are used by older users and what gratifications this use provides must be comprehensively revealed.

This study addresses a gap in the literature by examining how older adults in Turkey access and experience voice assistant technologies within the context of digital and social participation [2,6]. This study serves as a preliminary study for future longitudinal research on in-home usage, persona comparisons, and experimental interventions based on user interface design. While cognitive, physical, and sensory limitations associated with aging are well-documented barriers to technology use, empirical evidence grounded in older adults' everyday experiences, particularly regarding whether voice assistants effectively reduce these barriers, remains limited [8, 11]. Particularly considering the inadequacy of digital literacy initiatives for older adults in Turkey, revealing how these technologies are experienced in terms of user satisfaction, motivations, and communication barriers encountered provides an original and contextual contribution to digital inclusion discussions. The primary contribution of this study is not positioned within the general voice assistant literature, but rather in its contextual focus on Turkish-speaking older adults. Specifically, the study highlights the intersection of age-related, linguistic, and cultural barriers, making visible how these factors jointly shape user experience [36]. The set of scenarios used in this study is ecologically meaningful for the target audience (medication reminders, making calls, weather/news, music, shopping reminders), and a key strength of this study is that the tasks were selected to be directly related to the daily life practices of older adults, thereby preserving experiential reality. The article’s most valuable contribution is contextual; it demonstrates how language- and culture-specific recognition errors exacerbate age-related barriers. Thus, it reveals that voice interfaces, which are assumed to be “universal,” can systematically exclude older users who do not speak English. In other words, the study highlights the inequalities that arise at the intersection of aging, language, accent, and digital inclusion [36]. The significance of the research stems from addressing voice assistants not merely as technical innovations but also as communicative and psychosocial tools. In a literature that largely focuses on technical functions, this study proposes an important

perspective shift by examining older adults' expectations, gratification levels, and communication barriers within the framework of Uses and Gratifications Theory [14,15]. In this way, the research makes visible potential social benefits such as reducing loneliness, supporting psychological well-being, and enhancing social connectedness, while also aiming to produce evidence-based recommendations for policymakers and technology developers regarding the design of age-friendly digital solutions [5]. This research evaluates the learning processes of individuals aged 60 and over regarding voice assistant technologies, their participation in these technologies, and the communication barriers they encounter within the framework of Uses and Gratifications Theory.

2. Method

This research employed a qualitative case study design, which enables in-depth analysis of a complex phenomenon within its real-life context and is particularly suited to exploratory "how" and "why" questions (29). It documents and interprets the lived experiences of older adults engaging with voice assistant technology for the first time, in line with the experiential case study tradition (29). The phenomenon examined in this research is the interaction of individuals aged 60 and over with voice assistant technologies, their motivations regarding this technology, communicative barriers, and the level of gratification they experience after use.

2.1. Research Design

The research is characterized as a single case study because the situation under investigation encompasses a digital technology experience specific to a particular user group (older adults). This design has made it possible to conduct a holistic analysis without disregarding the cognitive, emotional, social, and environmental contexts of participants regarding technology. Additionally, since the study includes an experiential scenario application, the transformation in participants' perceptions regarding technology use has been monitored comparatively over time.

2.2. Participants

This study involved five (N=5) older adult participants. The participant group consisted of three female and two male older adults, with ages ranging from 60 to 75 years. Educational backgrounds varied between primary school and high school levels, with no participants having university education. The majority of participants (80%) lived with family members, while one participant lived alone (See Table 1). In terms of technology proficiency, most participants (60%) reported basic technology usage levels, while two participants demonstrated intermediate competency. Participants who had some prior experience with voice assistants (P3 and P4) demonstrated relatively higher task performance compared to those with no prior exposure. All participants accessed voice assistants through mobile phone devices, with familiarity spanning different platforms including Siri, Google Assistant, and Alexa. None of the participants reported diagnosed hearing, speech, or visual impairments. However, age-related sensory variation (e.g., reduced vocal volume, slower speech) was observed informally during sessions. All interactions were conducted in Turkish, and Turkish-language Google Assistant was used throughout the study. This diversity in prior exposure, combined with generally limited technology experience, provided valuable insights into the learning curve and usability challenges faced by typical older adult users encountering voice assistant technology. Purposive sampling was employed [21, 22], and the small sample size is consistent with the depth-oriented goals of qualitative case study research. The study does not aim at statistical generalizability; rather, it seeks to generate rich, transferable insights regarding the experiences of a specific population with a bounded technology encounter [29].

Table 1. *Participant Demographics and Technology Usage Background*

Question	P1 (72, Female)	P2 (65, Female)	P3 (60, Female)	P4 (66, Male)	P5 (75, Male)
Gender	Female	Female	Female	Male	Male
Age Range	70–74	65–69	60–64	65–69	75–79
Education Level	High School	Primary School	High School	High School	Primary School
Marital Status	Widowed	Married	Married	Married	Widowed
Living Situation	With Family	With Family	With Family	With Family	Alone
Technology Usage Level	Basic	Basic	Intermediate	Intermediate	Basic
Prior Voice Assistant Use	No	No	Yes	Yes	No
Which Assistant	Siri	Google	Siri	Google	Alexa
Duration of Use	0–3 months	0–3 months	0–3 months	0–3 months	0–3 months
Device	Phone	Phone	Phone	Phone	Phone

The purpose sampling method was used for sample selection [22]. The primary criterion for determining participants was 60 years of age or older and demonstrating basic interest in voice assistant technologies. This sampling approach is appropriate for exploring specific phenomena within particular populations [23].

2.3. Data Collection Tools and Process

Multiple data collection methods were employed in this research, following established protocols for technology usability studies with older adults [24]. The Turkish language was used in all interaction sessions, as Google Assistant was configured in Turkish. This is relevant to interpreting recognition errors, as Turkish-specific names and accents may influence system performance.

Demographic Information Form

A brief demographic form was utilized to determine participants' socio-demographic characteristics. This instrument collected essential background information including age, gender, education level, marital status, living arrangements, prior technology experience, and previous exposure to voice assistant technologies. These demographic variables provided important contextual information for interpreting participants' experiences and identifying potential patterns related to individual characteristics.

Forms

The pre and post experience questions, developed by the researcher under the demographic information forms, were designed to measure changes in participants' perceptions before and after the experience scenarios. The questions assessed variables such as level of knowledge regarding voice assistant capabilities, perceived ease of use, level of confidence in operating the technology, expectations regarding reduced loneliness and socialization opportunities, and intention to continue using voice assistants. The questions were formatted using a 5-point Likert scale. The pre- and post-experience forms primarily served as structured reflective tools to frame participants' awareness before and after the scenarios. Due to the small sample size (N=5), inferential statistical analyses were not performed, and the forms were not treated as psychometrically validated scales. Their function is to provide structured foundations for qualitative interview discussions rather than to produce quantitative outcome measures. Significant changes in individual responses were described descriptively where relevant.

The development of these forms was informed by systematic examination of national and international studies investigating older adults' perceptions of voice assistants [4, 8, 25],

thereby ensuring content validity. The literature review encompassed recent empirical research on technology acceptance, usability challenges, and gratifications experienced by older adult users of conversational interfaces. This evidence-based approach to instrument development enhanced the reliability and relevance of the measurement tools for the target population.

Semi-Structured Interview Form

A semi-structured interview guide was developed by the researcher to explore in depth older adults' experiences with voice assistants, including their initial encounters with the technology, purposes of use, perceived benefits and challenges, social and emotional reflections, and intentions for sustainable technology use. The questions were formulated in accordance with the core categories of UGT, specifically addressing information seeking, personal identity, social integration, and entertainment or escape dimensions. The semi-structured format allowed flexibility in exploring emerging themes while maintaining consistency across participants in addressing key research questions.

Experience Scenarios

Brief scenarios were prepared to enable participants to directly experience voice assistant technology in practical contexts. These scenarios included tasks such as medication reminders, calling grandchildren, playing music, and gathering daily information. Each scenario was designed to represent different functional dimensions of voice assistant use, including cognitive support, socialization, sense of independence, and entertainment. The scenarios provided participants with opportunities to engage in natural usage experiences within a controlled environment, facilitating observation of authentic interaction patterns and challenges. This experiential approach allowed participants to form technology perceptions based on actual use rather than abstract speculation.

Observation Notes and Reflective Statements

During the scenario applications, participants' behavioral responses, usage difficulties, and spontaneous verbal expressions were systematically recorded by the researcher using an observation form. This direct observation method captured real-time interactions that might not be fully articulated during subsequent interviews, including non-verbal cues, frustration indicators, expressions of satisfaction, and problem-solving strategies. When deemed appropriate, brief reflective notes were solicited from participants immediately following specific interactions to capture their in-the-moment impressions and emotional responses. These observation data complemented the interview and survey data, providing triangulation that strengthened the overall validity of the findings.

The data collection process consisted of the following phases:

Initial Meeting and Introduction (Maximum 5 minutes): During the initial meeting with participants, the purpose of the research was explained, voice assistant technologies (Siri, Alexa, Google Assistant) were introduced, and preliminary information was gathered regarding participants' demographic information and technology usage habits. This introductory phase is essential for building rapport and establishing baseline technology familiarity [26].

Mini Training Session (Maximum 10 minutes): Participants received brief training on the basic use of Google Assistant. This training demonstrated how to give voice commands, how to activate the device, and basic functions. Brief training sessions are recommended to reduce initial anxiety and provide a foundation for interaction [11].

Scenario-Based Tasks and Individual Experience (Maximum 10 minutes): Participants were asked to complete 5 different scenarios using Google Assistant that reflected situations they might encounter in their daily lives. During this process, participants were encouraged to explore the technology through trial and error. This approach aligns with user-centered design principles that emphasize learning through experience [27].

Semi-Structured Interview (Maximum 20 minutes): Following completion of the scenario tasks, semi-structured interviews were conducted with participants. During these interviews, questions were posed regarding their experiences, challenges they encountered,

attitudes toward technology, and potential for daily life usage. Semi-structured interviews allow for flexibility while maintaining focus on key research questions [21].

Final Assessment Questions: Semi-structured interview questions were administered to assess participants' interaction skills with the voice assistant, followed by final assessment questions. Test results were graded out of 65 points, and percentages were calculated. Usability testing provides quantitative measures to complement qualitative insights [28]. The authors acknowledge that the short training and scenario exposure (approximately 20 minutes total) limited the ecological validity of the findings and hindered the assessment of learning curves or sustained use. Therefore, the study was positioned as an initial, exploratory encounter study rather than a longitudinal or experimental investigation [29].

Usability Assessment

A structured usability observation rubric was used to evaluate participants' task completion during the five scenarios. The total possible score was 65 points, distributed as follows: each of the five scenarios was assessed on a 13-point scale covering (a) task initiation (0–3), (b) command formulation accuracy (0–3), (c) response comprehension (0–3), (d) error recovery (0–2), and (e) task completion (0–2). Scoring was conducted by the first author, who directly observed each session. Due to the single-evaluator setup, inter-rater reliability for the rubric itself was not established. Scoring was conducted independently by the first and second authors using the same usability rubric. To ensure inter-rater reliability, agreement between the two evaluators was calculated using the formula proposed by Miles and Huberman, resulting in an agreement rate of 85% [39]. Discrepancies in scoring were discussed and resolved through consensus, and the final scores were determined accordingly. The authors note this as a limitation and recommend that future studies employ dual-rater scoring with reported inter-rater reliability coefficients. The rubric scores should therefore be interpreted as indicative rather than definitive measures of task performance.

Scenarios

The scenarios used in the research were designed considering the needs that older adults might encounter in their daily lives.

Health Tracking - Medication Reminder Scenario: "Remind me to take my blood pressure medication every morning at 9:00 a.m." This scenario aims to evaluate participants' ability to use the voice assistant for health management, which is a critical need for older adults managing chronic conditions.

Social Interaction - Communicating with Grandchildren Scenario: "Hey Google, call Arda." This scenario examines the potential of voice assistants to facilitate social connections, which are vital for older adults' well-being.

Information Gathering and Staying Up-to-Date Scenario: "What's the weather like in Istanbul today?" and "Read today's news." This scenario evaluates participants' experiences in meeting daily information needs, supporting cognitive engagement, and autonomy.

Entertainment and Enjoyment - Music Playing Scenario: "Play a song by Müzeyyen Senar." This scenario aims to explore how technology can be used in leisure activities, which contribute to quality of life.

Cognitive Support and Daily Organization - Reminder List Scenario: "Remind me to buy milk and bread tomorrow morning." This scenario examines the support provided by voice assistants in daily life organizations, addressing common memory concerns among older adults.

In scenarios involving contact names (Scenario 2) and culturally specific artist names (Scenario 4), the researcher observed and noted instances where recognition errors occurred. These errors were associated with Turkish phonology and naming conventions that may not be well-represented in the assistant's default language model. This contextual factor is discussed as a source of communicative friction in the results section. The study did not experimentally manipulate phrasing alternatives; however, in cases of repeated recognition failure, the researcher offered a rephrased prompt as a naturalistic support measure.

2.4. Data Analysis

Two primary analysis methods were employed in the research. First, participants' processes of completing scenario tasks were recorded through observation, and interaction behaviors and emotional responses were noted. Observation is a fundamental method for understanding real-time user interactions with technology [29]. Second, using contextual analysis methods, participants' experiences, technology usage environments, and needs were evaluated from a holistic perspective. Data obtained from semi-structured interviews were analyzed through content analysis, and recurring themes and patterns were identified [30]. This thematic approach allows for systematic identification of meaningful patterns across qualitative data. Theme development followed an iterative process; in the first stage, the first author conducted open coding by examining the interview transcripts and observation notes line-by-line, generating initial codes grounded in participants' expressions and interaction experiences.

In the second stage, these initial codes were reviewed, compared, and grouped into broader categories. Through an inductive process, a preliminary codebook was developed, including code definitions, inclusion criteria, and representative examples. This codebook serves as a guiding framework for organizing and refining themes. The coding structure and emerging themes were then reviewed and refined in collaboration with the second author to ensure conceptual clarity and consistency. During this stage, codes were merged, revised, or redefined where necessary. To ensure coding reliability, a subset of the data was independently coded by the second author using the established codebook. For the usability rubric, inter-rater agreement between the two authors was calculated at 85% using the formula proposed by Miles and Huberman [39]. A separate inter-coder reliability analysis was conducted for thematic coding, also yielding an 85% agreement rate using the same formula [39]. Discrepancies between coders were discussed and resolved through consensus, and the codebook was finalized accordingly. Thus, the coding process was conducted through a collaborative and iterative procedure between the first and second authors, ensuring both analytical rigor and consistency. The codebook was developed inductively, with themes grounded in participants' own language and experiences. Given the small sample (N=5), formal data saturation was not assessed; instead, thematic consistency across participants served as an internal criterion for evaluating theme robustness, consistent with qualitative case study practice [29, 30]. Representative quotations are provided for each theme to support transparency.

In qualitative research, validity is primarily considered within the framework of internal and external validity dimensions. Internal validity is related to the extent to which the research accurately, deeply, and holistically reflects the phenomenon it addresses. In this context, it is important for the researcher to adopt a consistent, systematic, and rigorous approach in the data collection, analysis, and interpretation phases [30]. In this study, in order to increase internal validity, the findings obtained were presented with detailed descriptions; the data were first presented at a descriptive level and in an unbiased manner, and then the analytical and interpretive analysis process was initiated. Furthermore, the principles of homogeneity and heterogeneity were considered to clearly reveal the commonalities and differing characteristics among the data. External validity, on the other hand, is concerned with the applicability and transferability of the research results in similar contexts [21,30]. Accordingly, the data analysis process was explained in detail, aiming to make the research traceable and replicable by other studies.

Reliability in qualitative research is directly related to the transparency and traceability of the process and the consistency of the findings; in other words, it expresses the degree to which similar results can be obtained when using the same methods [30]. In this study, to ensure reliability, the data analysis process was carried out by two independent experts, and the resulting coding results were compared. The level of agreement between the coders was calculated using the reliability coefficient formula proposed by Miles and Huberman (1994); the reliability rate was determined to be 85%. This value indicates that the research findings are reliable and consistent.

2.5. Ethical Considerations

Prior to the research, participants were provided with detailed information about the purpose of the study, the process, and data usage, and their voluntary participation consent was obtained. Participants' personal information was kept confidential, and anonymity was ensured using a coding system (P1, P2, P3, P4, P5).

3. Results

The usability test results across all five scenarios revealed varying levels of success among participants in completing voice assistant tasks. Table 2 presents the overall performance scores for each participant. Scores reflect task performance as observed and scored by the researcher using the structured rubric described in Section 2.4. These scores are intended as descriptive indicators of performance, not as psychometrically validated measures.

Table 2. *Participant Demographics and Usability Test Scores*

Participant	Age	Gender	Score	Max Score	Percentage
P1	72	Female	38	65	58.46%
P2	65	Female	38	65	58.46%
P3	60	Female	43	65	66.15%
P4	66	Male	36	65	55.38%
P5	75	Male	39	65	60.00%

The results indicate that participant performance ranged from 55.38% to 66.15%, with P3 achieving the highest score and P4 the lowest. The average success rate across all participants was approximately 59.69%, suggesting moderate overall usability but also highlighting significant room for improvement in voice assistant design for older adult users. In addition to overall usability scores, scenario-based performance patterns were examined descriptively to enhance analytical transparency. Descriptive reporting is particularly valuable in small-sample qualitative studies, as it supports traceability and provides a clearer understanding of observed interaction patterns [29, 39].

Participants demonstrated relatively higher success in simpler, single-step tasks such as information retrieval and music playback. In contrast, lower performance was observed in scenarios requiring multi-step command formulation, such as setting reminders and initiating contact-based communication. Recognition-related difficulties were more frequently observed in scenarios involving proper names (e.g., calling a contact or requesting music by artist name), whereas comprehension-related challenges emerged in scenarios where the system produced longer or more complex responses. These descriptive patterns provide additional insight into where interaction breakdowns most commonly occur across scenarios.

Table 3. *Scenario-Based Performance and Observed Difficulties*

Scenario	Task Description	Performance Level	Main Observed Difficulties
Scenario 1	Medication Reminder - Health Tracking	Moderate	Confusion between alarm and reminder Difficulty in command repetition
Scenario 2	Communicating with Grandchildren - Social Interaction	Low–Moderate	Name recognition errors (e.g., “Arda”) Uncertainty about system response

Scenario 3	Daily Information Gathering - Staying Informed	High	Long and complex responses Difficulty controlling information flow
Scenario 4	Entertainment and Enjoyment - Music Playing	High	Artist name recognition errors Limited control over playback
Scenario 5	Reminder List - Cognitive Support and Daily Organization	Moderate	Difficulty with multi-step commands Uncertainty in managing saved reminders

Scenario 1: Medication Reminder - Health Tracking

The medication reminder scenario, which required participants to command "Remind me to take my blood pressure medication every morning at 9:00 a.m.," revealed significant insights into how older adults perceive and interact with voice assistant technology in health management contexts.

Positive Outcomes

Participants demonstrated three primary positive experiences when successfully completing this health-related task. First, participants expressed a notable sense of independence, indicating that the ability to manage their medication schedules autonomously through voice commands contributed to their self-reliance. Second, the medication reminder function provided participants with a sense of security, as automated reminders reduced anxiety about forgetting critical health-related tasks. Third, participants perceived that the voice assistant gave them greater control over their health management.

Challenges and Negative Experiences

Despite these positive outcomes, participants encountered notable difficulties that hindered the full effectiveness of the medication reminder scenario. A primary challenge was confusion between alarms and reminders. Several participants expressed confusion between alarm and reminder functions, indicating difficulty in distinguishing between these two system features during task completion. Additionally, several participants reported forgetting to repeat commands when the voice assistant failed to recognize their initial input. This pattern indicates potential issues with both the technology's speech recognition accuracy for older adults' voices and participants' understanding of error recovery procedures. This pattern indicates potential issues with both the technology's speech recognition accuracy for older adults' voices and participants' understanding of error recovery procedures. The need to repeat commands can create frustration and reduce perceived usability, particularly when immediate success is not achieved. This was particularly evident with Turkish given names (e.g., "Arda"), where Turkish phonological patterns including vowel harmony and specific consonant clusters may not align well with the default recognition weightings in standard Google Assistant models. Recognition errors of this nature have been documented in multilingual and non-English voice assistant deployments [36], and represent a systemic equity concern for non-anglophone older user populations.

Scenario 2: Communicating with Grandchildren - Social Interaction

The social interaction scenario required participants to use the voice command "Hey Google, call Arda" to initiate a phone call with a family member, specifically designed to assess the technology's role in maintaining intergenerational connections.

Positive Outcomes

Participants exhibited strong positive emotional responses when successfully completing this task. The ease of initiating calls through voice commands eliminated several barriers that traditionally complicate phone usage for older adults, such as navigating contact

lists, remembering phone numbers, or managing touchscreen interfaces. The scenario also revealed that voice-activated calling reduced the cognitive load associated with traditional phone usage.

Challenges and Negative Experiences

Several participants struggled with the proper pronunciation and enunciation required for the voice assistant to recognize contact names accurately. This was particularly evident with Turkish given names (e.g., “Arda”), where Turkish phonological patterns — including vowel harmony and specific consonant clusters — may not align well with the default recognition weightings in standard Google Assistant models. Recognition errors of this nature have been documented in multilingual and non-English voice assistant deployments [36] and represent a systemic equity concern for non-anglophone older user populations. Additionally, some participants expressed uncertainty about whether the command had been successfully executed, as the feedback provided by the voice assistant was not always immediately clear or sufficiently prominent.

Scenario 3: Daily Information Gathering - Staying Informed

This scenario involved two related tasks: asking for weather information ("What's the weather like in Istanbul today?") and requesting news updates ("Read today's news"). These tasks assessed participants' ability to use voice assistants for accessing timely, practical information.

Positive Outcomes

Participants generally found the information retrieval of tasks to be straightforward and valuable. The immediate access to weather information was particularly appreciated, as it directly supported daily decision-making regarding activities and appropriate clothing. The conversational nature of the queries aligned well with participants' natural speech patterns, making the interaction feel intuitive. The news reading function was also well-received by participants who expressed interest in staying informed about current events. For those with visual impairments or reading difficulties, the audio format provided an accessible alternative to traditional news consumption methods. Participants noted that this feature could potentially reduce their reliance on family members to relay information, thereby enhancing independence.

Challenges and Negative Experiences

Despite these benefits, participants encountered several difficulties. The voice assistant's responses to weather queries were sometimes overly detailed or technical, with confusing or unnecessary terminology. Participants expressed a preference for concise, actionable information rather than comprehensive meteorological data. The news reading function presented additional challenges. Participants found it difficult to control the pace and selection of news stories, with some expressing frustration at being unable to easily skip topics of interest or replay information they had missed. The linear, non-interactive nature of the news delivery contrasted with participants' expectations of being able to navigate content more flexibly, as they might with printed newspapers or television news programs.

Scenario 4: Entertainment and Enjoyment - Music Playing

The entertainment scenario asked participants to request music by commanding "Play a song by Müzeyyen Senar," assessing the voice assistant's role in leisure activities and cultural engagement.

Positive Outcomes

This scenario elicited some of the most positive emotional responses from participants. The ability to instantly access music from preferred artists through simple voice commands was highly valued, particularly for participants with mobility limitations or difficulties operating traditional media devices. Participants expressed delight at the ease with which they could enjoy music that held personal or cultural significance. The music playing function also demonstrated potential for mood regulation and emotional well-being. Participants noted that having immediate access to preferred music could help alleviate feelings of loneliness or boredom, providing a form of companionship and comfort. The nostalgic value of accessing familiar

artists and songs appeared to contribute significantly to participants' positive perceptions of this feature.

Challenges and Negative Experiences

Some participants struggled with the pronunciation of artist names. Specifically, the name “Müzeyyen Senar” (a culturally significant Turkish musical artist) was frequently misrecognized, either resulting in no match or an incorrect artist. This finding illustrates how culturally non-dominant names function as points of failure in voice assistant systems that are trained predominantly on anglophone or high-resource-language data [36]. Additionally, participants expressed limited understanding of how to control playback once music began playing, with commands for pausing, skipping, or adjusting volume not being intuitive to all participants.

Scenario 5: Reminder List - Cognitive Support and Daily Organization

The final scenario required participants to set up a shopping reminder by commanding "Remind me to buy milk and bread tomorrow morning," testing the voice assistant's utility for everyday organizational tasks and cognitive support.

Positive Outcomes

Participants recognized the practical value of this feature for managing daily tasks and compensating memory concerns. The ability to quickly capture reminders without needing to write them down or navigate complex applications was seen as highly beneficial. Participants appreciated that the voice assistant could serve as an external memory aid, reducing the cognitive burden of remembering multiple tasks throughout the day. The natural language processing capabilities of the assistant were particularly evident in this scenario, as participants could specify items and timing in conversational language rather than following rigid command structures. This flexibility made the interaction feel more natural and less like operating a traditional computing device.

Challenges and Negative Experiences

Despite these advantages, participants encountered difficulties with reminder management. Once reminders were set, participants were uncertain about how to review, modify, or delete them using voice commands alone. This limitation meant that participants could not easily verify that their reminders had been correctly understood and stored by the system. Additionally, some participants struggled with formulating commands that included multiple pieces of information, such as both the items to remember and the timing of the reminder. When commands were complex or included in multiple items in a list, the voice assistant sometimes failed to capture all the information accurately, requiring participants to repeat or rephrase their requests.

Speech Recognition Errors and User Coping Strategies

Across all scenarios, speech recognition errors emerged as a recurring interaction barrier. These errors were particularly evident in tasks involving proper names and culturally specific content, such as contact names (e.g., “Arda”) and artist names (e.g., “Müzeyyen Senar”). At the participant level, recognition-related errors occurred at least once per participant in scenarios involving name-based commands, particularly in Scenario 2 (calling a contact) and Scenario 4 (music playback). While the small sample size does not allow for statistical generalization, this pattern was consistently observed across participants. The types of recognition problems included misinterpretation of names, failure to detect the intended entity, and incorrect substitutions with phonetically similar words. These issues were more pronounced when participants spoke with lower vocal intensity or slower articulation.

Participants employed several coping strategies when encountering recognition errors. The most common strategy was repeating the same command without modification. Some participants attempted to increase vocal clarity by speaking louder or more slowly. A smaller number of participants used reformulation strategies, such as adding contextual cues (e.g., “my grandson Arda”), which were more effective in achieving successful outcomes. However, most participants did not spontaneously adopt adaptive reformulation strategies, indicating limited

awareness of effective interaction repair mechanisms. This resulted in increased cognitive load and occasional frustration during task completion. These findings highlight the need for voice assistant systems to provide more explicit feedback and guided error-recovery support, particularly for older users interacting in non-English contexts.

Table 4. *Thematic Analysis Results*

Theme	Sub themes	Codes	Example Quotes
Theme 1: Cognitive Overload and Comprehension Barriers	Attention and Information Overload Error-Induced Cognitive Disruption	• Difficulty formulating commands • Loss of attention with long information • Cognitive disruption/panic caused by incorrect responses • Increased cognitive load due to follow-up questions	"I got confused; I didn't know what to say." (P1) "I got bored when the news was too long." (P3) "It said something else, I panicked." (P2) "It asked 'What time?' What's the point?" (P5)
Theme 2: Technical Barriers and Loss of Control	Perceived Complexity and Error Anxiety Interface and Navigation Confusion Low Perceived Autonomy	• Fear of making mistakes • Perceiving technology as complicated • Confusion about apps/subscriptions • Follow-up questions perceived as unnecessary • Lack of perceived independence	"I'm afraid it will call the wrong person." (P2) "It's too complicated; I can't grasp it." (P5) "When Spotify Premium popped up, it ruined my mood." (P4) "It asked 'What time? 'what's the point?" (P5) "I didn't think of it that way; independence didn't occur to me." (P1)
Theme 3: Social-Emotional Deficits	Emotionally Meaningful Functional Use Absence of Social Companionship	• Not perceiving the assistant as a social partner • Emotional connection formed primarily through music •Preference for human interaction over AI assistant	"No, it doesn't reduce loneliness." (P2) "When it played Müzeyyen Senar, it lifted my mood." (P4)

The thematic analysis revealed three interrelated patterns that characterize older adults' experiences with voice assistants. First, participants reported significant cognitive challenges during interaction, including difficulty formulating commands, sustaining attention when information was lengthy, and managing follow-up questions. Incorrect or unexpected responses often led to confusion or anxiety, indicating that such interactions increased cognitive load and disrupted information processing rather than facilitating it. Second, the findings point to perceptions of technical complexity and a diminished sense of control, which functioned as barriers to independent use. Participants frequently expressed fear of making mistakes, viewed the technology as overly complicated, and experienced confusion regarding applications,

subscriptions, or system prompts. Follow-up questions were commonly perceived as unnecessary and intrusive, reinforcing feelings of dependence rather than autonomy. Finally, the analysis showed limited social and emotional gratification associated with voice assistant use. Most participants did not conceptualize the assistant as a social or relational partner, instead positioning it primarily as a functional tool. Emotional engagement was largely confined to specific features, particularly music playback, which occasionally enhanced mood but did not substantially alleviate feelings of loneliness or foster a sustained sense of social connection. Three participants (P1, P2, P5) spontaneously expressed discomfort regarding potential data retention and the sense of being continuously monitored. Among participants living with family members (P1 and P2), concerns centered primarily on privacy from external parties, whereas P5, who lived alone, expressed concerns more closely related to perceived surveillance by family members who might access the device. Concerns of this type have been documented in the literature on smart speaker adoption and are particularly salient for older adults with limited prior exposure to always-on devices [37].

4. Discussion

The findings from this case study reveal that voice assistants partially compensate for cognitive and physical limitations commonly experienced by older adults, providing practicality, time savings, and a sense of independence in daily activities [31]. These outcomes align with broader research on assistive technologies emphasizing the importance of supporting autonomy and reducing functional barriers in aging populations [6, 11]. Analysis through the UGT framework revealed four core gratifications that emerged from participants' interactions with voice assistants: information seeking, self-efficacy and personal identity reinforcement, social integration, and entertainment or escape [16]. These gratifications represent the underlying motivations and satisfactions that drive older adults' adoption and continued use of voice assistant technology. Participants reported increased confidence and a greater sense of control following the medication reminder and shopping list scenarios, suggesting that voice-activated reminder functions may support self-management and reduce cognitive burden among older adults managing daily health routines [9]. The ability to externalize memory tasks through simple voice commands appeared to provide psychological relief and reinforce participants' sense of competence.

Item-level shifts observed in pre- and post-experience reflections can be interpreted through the UGT framework in terms of the gap between gratifications sought and gratifications obtained [14, 18]. Participants initially expressed expectations related to ease of use, independence, and social connection (gratifications sought). However, the actual interaction experience revealed a more complex outcome, where certain gratifications were achieved (e.g., entertainment and basic information access), while others were only partially fulfilled or remained unmet due to interaction difficulties (gratifications obtained). In particular, while participants anticipated that voice assistants would reduce cognitive effort and support autonomy, the need to repeat commands, manage errors, and interpret system responses increased cognitive load in some scenarios. This discrepancy highlights a gap between expected and experienced gratifications, suggesting that usability challenges directly influence the continuity of technology use among older adults [38].

The communication scenario, particularly the task of calling grandchildren, supported the maintenance of social bonds and intergenerational connections. Voice assistants facilitated emotional closeness and social connectedness by reducing technical barriers to communication [10]. This finding is particularly significant given the well-documented relationship between social isolation and negative health outcomes among older adults. The technology's potential to strengthen family ties and reduce feelings of loneliness emerged as a critical benefit that extends beyond mere functional utility. The music playback scenario produced the strongest emotional satisfaction among all tested tasks. The nostalgic value of accessing culturally significant music triggered positive emotional responses and strengthened participants' attitudes toward

technology [32]. This suggests that voice assistants may serve an important role in supporting emotional well-being and maintaining cultural identity among older adults, particularly when the technology can accommodate diverse musical preferences and artist recognition. Despite these benefits, several significant barriers emerged that hindered optimal use and acceptance of voice assistant technology. Complexity and cognitive load represented key obstacles to successful interaction. Long audio responses, conceptual confusion between similar functions (such as alarms versus reminders), and premium application requirements reduced participants' motivation to continue using the technology [23,33]. These findings underscore the importance of designing voice interfaces that align with older adults' cognitive processing capabilities and expectations.

Participants consistently expressed a preference for short, clear, single-step commands with immediate and predictable outcomes, reflecting established principles of age-friendly interface design emphasizing simplicity, error tolerance, and transparency [6, 11]. The confusion between alarms and reminders observed in this study reflects a broader design challenge: voice assistant architectures often distinguish between these functions in ways that are not transparent or intuitive to users whose mental models are shaped by non-digital practices [35]. Designers are encouraged to explore disambiguation prompts that are brief, confirmatory in tone, and do not require users to recall technical category names (e.g., “Should I set this as a recurring reminder?” rather than “Would you like an alarm or a reminder?”).

The recognition errors associated with Turkish proper names and artist names in this study highlight a systemic issue in voice assistant accessibility: the technology’s performance is not language- or culture-neutral. Older adults who interact in less-resourced languages or with culturally specific vocabularies encounter a higher frequency of interaction failures that are not attributable to user error. This finding is consistent with Seaborn et al. [36], who documented similar challenges in cross-cultural voice assistant deployments, and underscores the importance of culturally localized training data and fallback dialogue strategies in assistive voice technologies.

4.1 Design and Implementation Recommendations

The findings of this study provide several data-driven design implications for improving voice assistant interactions for older adults. First, in critical tasks such as setting reminders or initiating communication, systems should explicitly confirm the recognized command and clearly state the intended action. Rephrasing the user’s input (e.g., “I will call Arda now”) can enhance user trust, reduce uncertainty, and increase error awareness. This type of confirmatory feedback is particularly important for older users who may experience elevated cognitive load and uncertainty during novel technology interactions [9, 43].

Second, interaction design should support guided error recovery. Rather than requiring users to independently reformulate commands, systems should provide simple and adaptive prompts (e.g., “Did you mean Arda from your contacts?”). Such support mechanisms can reduce frustration and facilitate more effective interaction repair, especially for users with limited digital literacy.

Third, localization should be considered beyond direct language translation. Voice assistant systems should incorporate culturally specific elements such as personal names, media preferences, and everyday communication practices. The findings indicate that recognition failures were more frequent in culturally specific inputs, suggesting that language models should be adapted to local linguistic and cultural contexts. This aligns with research emphasizing the importance of culturally sensitive AI systems [36].

Fourth, voice interfaces should be designed to minimize cognitive load by providing shorter, clearer responses and avoiding unnecessary follow-up questions. Older adults demonstrated a clear preference for simple, predictable, and single-step interactions. Designing for reduced cognitive demand is a key principle in age-friendly technology development [6]. In addition, several interaction design principles can be derived from the observed user behaviors.

Longer silence tolerance during voice input, clear listening indicators, and concise system responses can support older users' sense of control and comprehension. Participants demonstrated difficulty following extended responses and managing interaction flow, suggesting that shorter summaries and more structured dialogue transitions may improve usability. Reliable topic transitions and clear feedback mechanisms can further reduce uncertainty and enhance user confidence during interaction. These principles are consistent with prior research emphasizing the importance of cognitive load reduction and clear interaction cues in age-friendly interface design [6].

Finally, inclusive speech recognition should be prioritized. Systems should better accommodate variations in accent, pronunciation, and speech pace associated with aging. These findings suggest that recognition limitations are not solely technical issues but also relate to accessibility and digital inclusion. Designing more inclusive voice interaction systems can help reduce disparities in technology use among older populations [36].

5. Conclusion and Recommendations

This research demonstrates that voice assistants can provide meaningful benefits in terms of practicality, independence, and confidence for individuals aged 60 and older. Through the UGT framework, four gratification dimensions were identified as relevant to participants' voice assistant interactions: information access, self-efficacy and personal identity reinforcement, social integration, and entertainment or escape. However, the degree to which these gratifications were fulfilled varied considerably across tasks and individuals. The music playback and communication functions produced the highest emotional impact, suggesting that voice assistants hold particular promise for supporting emotional well-being and social connection among older adults. However, significant usability challenges persist. Conceptual confusion between similar functions, excessively long or complex responses, and premium service barriers emerged as the primary obstacles to adoption and sustained use. Older adults demonstrated clear preferences for short, clear, single-step commands that minimize cognitive load and produce predictable outcomes. The findings suggest that accent- and name-recognition failures should not be framed solely as technical limitations but also as matters of linguistic justice and digital equity, particularly for non-anglophone older users [36, 40]. Voice assistant systems that fail to adequately recognize culturally and linguistically diverse inputs may unintentionally exclude older users, particularly those interacting in non-English contexts. Addressing these challenges is therefore essential not only for improving usability but also for promoting equitable access to digital technologies.

Future research should prioritize the development of validated measurement scales specifically designed to assess age-friendly voice assistant features, evaluating command simplicity, feedback clarity, error tolerance, and emotional engagement. Longitudinal research is essential to examine habit formation, sustained motivation, and technology abandonment. The social context of technology use, particularly family involvement, deserves greater attention. Structured voice assistant literacy programs for older adults should emphasize short commands, error-tolerant strategies, and visual guidance. Technical improvements to voice assistant design should include summary modes for concise responses, culturally sensitive name matching algorithms accommodating Turkish and other non-anglophone naming conventions, simplified onboarding procedures, and comparative platform evaluations that explicitly address accessibility dimensions for older users [35-36].

The findings should be interpreted specifically within the context of Google Assistant used via smartphone, as older adults' experiences with voice assistants may vary across platforms, devices, and interaction modalities [42]. In addition, this study examined initial experiences in controlled scenarios rather than prolonged use in natural home settings; however, prior longitudinal research suggests that older adults' perceptions and usage patterns may change over time in real-world contexts [41]. Cognitive load in the present study was interpreted primarily through observational and self-reported data, and future research could

strengthen this interpretation by incorporating more objective indicators such as reformulation frequency, task completion time, and scenario-based error rates. Support mechanisms should also be designed to guide older adults without undermining user autonomy, particularly during early use, when simple and repeatable learning supports may be especially beneficial [43]. Finally, future studies should broaden their ethical considerations by explicitly addressing data protection, boundaries of use, and safeguards against over-reliance on technology.

In addition to the main findings, several nuanced observations emerged regarding prior experience, system response design, and privacy perceptions. Participants with limited prior experience using voice assistants (P3 and P4) demonstrated relatively higher task performance compared to others. Their familiarity with basic command structures and interaction flow enabled them to complete tasks more fluently. However, prior experience did not eliminate interaction challenges. These participants also encountered difficulties related to name recognition, command formulation, and understanding system responses. Although they appeared more confident and slightly less cognitively strained, confusion still occurred, particularly in multi-step tasks and situations involving a long or ambiguous system of feedback. This suggests that prior exposure facilitates interaction but does not fully resolve usability challenges for older adults.

Another important finding concerns the design of system responses. Participants had difficulty following long and information-dense responses. In particular, responses that included multiple pieces of information delivered consecutively—such as weather reports containing temperature, humidity, and wind details—were perceived as overwhelming. Similarly, continuous delivery of news content led to loss of attention and reduced comprehension. Participants consistently expressed a preference for shorter, simpler, and more direct responses. These findings highlight the importance of managing information density and response length in voice interaction design for older users.

Finally, privacy perceptions emerged as an influential factor in user experience. Although participants were provided with a general explanation at the beginning of the study regarding how the system operates, some participants still expressed concerns about being monitored during interaction. This indicates that initial explanations alone may not be sufficient to establish trust. Repeated and clearer privacy-related explanations throughout the interaction process could potentially enhance user confidence and acceptance. However, it should also be noted that deeply rooted beliefs and concerns about technology and data security among older adults may not be easily mitigated through information alone. Trust appears to develop gradually over time through repeated and positive interaction experiences rather than through one-time explanations. In conclusion, voice assistants have substantial potential to improve quality of life for older adults, but realizing this potential requires age-friendly, accessible, and cognitively appropriate design. The technology must be developed with explicit consideration of the unique needs, capabilities, and preferences of older adult users, rather than simply adapting designs created for younger, more technologically proficient populations.

6. Limitations

The study's use of Google Assistant exclusively is acknowledged as a limitation of generalizability. Comparative platform studies for instance, examining touch-enabled Alexa Echo Show against voice-only interfaces could clarify how multimodal feedback affects usability for older adults and helps designers understand trade-offs between voice, visual, and tactile interaction modalities [37]. The brief, single-session exposure used in this study is also a significant limitation: it precludes any assessment of habituation, learning curves, or evolving attitudes over time. Longitudinal or diary-based home-use studies would substantially strengthen the evidence base for this research area.

The study is explicitly positioned as a bounded, exploratory case study with five participants, conducted within a single structured session. The findings are not intended to generalize to the broader older adult population but rather to contribute transferable insights

and to identify design and research priorities. The following limitations should be noted: (1) the small sample (N=5) limits statistical and broad empirical generalizability; (2) the brief session duration limits the capture of learning effects or habituation; (3) the single-platform (Google Assistant, Turkish language) design limits cross-platform comparability; and (4) the pre-/post-test forms, while useful as reflective anchors, were not treated as validated instruments and yielded no inferential data.

This study should be interpreted as a case study rather than a basis for broad generalization. The very small sample size (N = 5), the short single-session exposure, and the guided nature of the scenarios limit transferability, ecological validity, and any meaningful assessment of learning effects over time. This limitation is especially important because prior longitudinal research has shown that older adults' perceptions and uses of voice assistants evolve with sustained real-world experience, and that initial convenience or novelty may not persist in longer-term use [41]. In addition, the study was restricted to a single platform (Google Assistant) and a single interaction modality (phone-based voice use), which narrows the generalizability of findings across devices, ecosystems, and multimodal interfaces. This is relevant because older adults' intentions to use voice assistants are shaped by multiple factors beyond usability, including emotional needs, privacy concerns, self-efficacy, and perceived companionship [42]. Methodologically, although the structured usability rubric improves analytic transparency, the use of a single evaluator limits inter-rater reliability, and the qualitative coding procedure would benefit from more explicit reporting of coder roles, codebook development, and agreement calculation. The absence of systematic measurement of speech-recognition failures further constrains interpretation, particularly because recent ASR scholarship has shown that accent-related recognition problems remain conceptually and technically under-addressed, with implications for accessibility and linguistic equity [40]. Nevertheless, the study makes a meaningful contextual contribution by showing how age-related barriers may be compounded by language- and culture-specific recognition difficulties. Prior work has also demonstrated that communication style and anthropomorphic framing can significantly influence older adults' trust, acceptance, and mental workload when interacting with voice assistants, suggesting that future studies should move toward larger and more diverse samples, in-home longitudinal designs, and experimental comparisons of conversational style, disambiguation strategies, feedback design, and localized ASR adaptations for older users [43].

Authors' Declaration

The authors declare that there are no conflicts of interest related to this study.

Authors' Contribution Statement

The first author conceptualized the research topic as part of their master's thesis, conducted the data collection process, performed data analysis, and prepared the initial draft of the manuscript. The second author, serving as the thesis supervisor, provided guidance throughout all research phases, contributed to the research design, supervised the data analysis process, and reviewed and edited the manuscript for publication.

Author Notes

Based on *Academic Integrity and Transparency in AI-assisted Research and Specification Framework* (44), the authors of this paper acknowledge that the paper was reviewed, edited, and refined with the assistance of DeepL and Claude (Versions as of January 2026), complementing the human editorial process. The human authors critically assessed and validated the content to maintain academic rigor. The authors also assessed and addressed potential biases inherent in the AI-generated content. The final version of the paper is the sole responsibility of human authors.

References

1. London, A.J., Chang, M.L., Reig, S. *et al.* Avoiding a bridge to nowhere: managing the transfer of agency when an older adult can no longer use assistive AI. *AI Ethics* 6, 138 (2026). https://doi.org/10.1007/s43681-025-00981-5
2. Schroeder, T., Dodds, L., Georgiou, A., Gewald, H., & Siette, J. (2023). Older adults and new technology: Mapping review of the factors associated with older adults' intention to adopt digital technologies. *JMIR aging*, *6*(1), e44564.https://doi.org/10.2196/44564
3. Chen, G., Bhattacharya, S., & Spaulding, R. (2025). The role of AI driven personal assistants in geriatric care: opportunities, challenges, and future directions. *Ann Gerontol Geriatr Res*, *1*(1), 1003. https://annggr.org/articles/GGR-1003.html
4. Cao, X., Zhang, H., Zhou, B., Wang, D., Cui, C., & Bai, X. (2024). Factors influencing older adults' acceptance of voice assistants. *Frontiers in Psychology*, *15*, 1376207. https://doi.org/10.3389/fpsyg.2024.1376207
5. Jones, V. K., Yan, C., Shade, M. Y., Boron, J. B., Yan, Z., Heselton, H. J., ... & Dube, V. (2024). Reducing loneliness and improving social support among older adults through different modalities of personal voice assistants. *Geriatrics*, *9*(2), 22. doi: 10.3389/fpubh.2021.750736
6. Quinn, K., Leiser Ransom, S., O'Connell, C., Muramatsu, N., Marquez, D. X., & Chin, J. (2024). Assessing the feasibility and acceptability of smart speakers in behavioral intervention research with older adults: mixed methods study. *Journal of medical Internet research*, *26*, e54800. https://doi.org/10.2196/54800
7. Benevento, A. D., Ciulla, G., & Merlo, G. (2025). Future technologies in alternative and augmented communication: a scoping review of innovations. *Frontiers in Communication*, *10*, 1607531. https://doi.org/10.3389/fcomm.2025.1607531
8. Kim S. Exploring how older adults use a smart speaker-based voice assistant in their first interactions: qualitative study. JMIR Mhealth Uhealth. 2021;9(1): e20427. https://doi.org/10.2196/20427
9. Portet, F., Vacher, M., Golanski, C. *et al.* Design and evaluation of a smart home voice interface for the elderly: acceptability and objection aspects. *Pers Ubiquit Comput* **17**, 127–144 (2013). https://doi.org/10.1007/s00779-011-0470-5
10. Reis, A., Paulino, D., Paredes, H., Barroso, J. (2017). Using Intelligent Personal Assistants to Strengthen the Elderlies' Social Bonds. In: Antona, M., Stephanidis, C. (eds) Universal Access in Human–Computer Interaction. Human and Technological Environments. UAHCI 2017. Lecture Notes in Computer Science(), vol 10279. Springer, Cham. https://doi.org/10.1007/978-3-319-58700-4_48
11. Pradhan, A., Mehta, K., & Findlater, L. (2018, April). " Accessibility Came by Accident" Use of Voice-Controlled Intelligent Personal Assistants by People with Disabilities. In *Proceedings of the 2018 CHI Conference on human factors in computing systems* (pp. 1-13). https://doi.org/10.1145/3173574.3174033
12. Şener, B. S., & Özkaya, H. (2023). Investigation of the Relationship Between Social Media Addiction and Orthorexia Nervosa in Adult Individuals Who Applied to Obesity Polyclinic. *Addicta: The Turkish Journal on Addictions*, *10*(2), 135-141. https://doi.org/10.5152/ADDICTA.2023.23042
13. J. Lee, S. Lee, C. -H. Kim and J. Yoon, "Technology-Transferability Analysis of Universities and Public Research Institutes Using Deep Neural Networks," in *IEEE Access*, vol. 11, pp. 135196-135211, 2023, doi: 10.1109/ACCESS.2023.3337830.
14. Katz, E., Blumler, J. G., & Gurevitch, M. (1973). Uses and Gratifications Research. *The Public Opinion Quarterly*, *37*(4), 509–523. http://www.jstor.org/stable/2747854
15. Rauschnabel, P. A. (2018). Virtually enhancing the real world with holograms: An exploration of expected gratifications of using augmented reality smart glasses. *Psychology & Marketing*, *35*(8), 557-572. https://doi.org/10.1002/mar.21106

16. Kumar, P., Chauhan, S., & Awasthi, L. K. (2023). Artificial intelligence in healthcare: review, ethics, trust challenges & future research directions. *Engineering Applications of Artificial Intelligence*, *120*, 105894. https://doi.org/10.1016/j.engappai.2023.105894
17. Athwal N, Istanbulluoglu D, McCormack SE (2019), "The allure of luxury brands' social media activities: a uses and gratifications perspective". *Information Technology & People*, Vol. 32 No. 3 pp. 603–626. https://doi.org/10.1108/ITP-01-2018-0017
18. Elmas, E. (2024). *Kullanımlar ve Doyumlar Teorisi Perspektifinden Instagram Fenomenlerinin Marka Etkileşimi Üzerindeki Rolü ve bir Araştırma* (Unpublished master's thesis). Marmara University.
19. Creswell JW, Clark VLP. Designing and conducting mixed methods research. Sage Publications; 2017.
20. Patton C, Sawicki D, Clark J. Basic methods of policy analysis and planning. Routledge; 2015.
21. Palinkas, L.A., Horwitz, S.M., Green, C.A. *et al.* Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Adm Policy Ment Health* 42, 533–544 (2015). https://doi.org/10.1007/s10488-013-0528-y
22. Sayago, S. (Ed.). (2019). *Perspectives on human-computer interaction research with older people*. Switzerland: Springer International Publishing.
23. Seaborn, K., Sawa, Y., & Watanabe, M. (2024). Coimagining the future of voice assistants with cultural sensitivity. *Human Behavior and Emerging Technologies*, *2024*(1), 3238737. https://doi.org/10.1155/2024/3238737
24. Zhu, D., Al Mahmud, A., & Liu, W. (2024). Digital storytelling intervention for enhancing the social participation of people with mild cognitive impairment: co-design and usability study. *JMIR aging*, *7*, e54138.https://doi.org/10.2196/54138
25. Kvale S, Brinkmann S. InterViews: Learning the craft of qualitative research interviewing. SAGE Publications; 2015.
26. Rudhumbu, N. Antecedents of university lecturers' intentions to adopt information and communication technology in Zimbabwe. *Educ Inf Technol* **25**, 5117–5132 (2020). https://doi.org/10.1007/s10639-020-10205-4
27. Nielsen J. Usability 101: Introduction to usability [Internet]. Nielsen Norman Group; 2012. Available from: https://www.nngroup.com/articles/usability-101-introduction-to-usability/
28. Angrosino, M. (2007). *Doing ethnographic and observational research*. Sage.
29. Creswell, J. W., & Poth, C. N. (2018). Qualitative Inquiry and Research Design: Choosing among five approaches. SAGES Publication.
30. Charness N, Boot WR. Aging and Information Technology Use: Potential and Barriers. Curr Dir Psychol Sci. 2009;18(5):253–8.https://doi.org/10.1111/j.1467-8721.2009.01647.x
31. Kowalski J, Jaskulska A, Skorupska K, Abramczuk K, Biele C, Kopeć W, et al. Older adults and voice interaction: A pilot study with Google Home. In: Proceedings of CHI EA 2019. ACM; 2019. p. 1–6.https://doi.org/10.1145/3290607.3312973
32. Sedikides C., Wildschut T., Routledge C., and Arndt J. (2015) Nostalgia counteracts self-discontinuity and restores self-continuity, Eur. J. Soc. Psychol., 45, 52–61, doi: 10.1002/ejsp.2073.
33. Mihailidis, A., Boger, J.N., Craig, T. *et al.* The COACH prompting system to assist older adults with dementia through handwashing: An efficacy study. *BMC Geriatr* **8**, 28 (2008). https://doi.org/10.1186/1471-2318-8-28
34. Galliers, J. R. & Wilson, S. (2013). *An Exploratory Study into the Accessibility of a Multi-User Virtual World for Young People with Aphasia*. Paper presented at the BCS HCI 2013 - The Internet of Things XXVII, 9 - 13 Sep 2013, Brunel University, Uxbridge, UK. http://ewic.bcs.org/content/ConWebDoc/51712
35. Portet, F., Vacher, M., Golanski, C. *et al.* Design and evaluation of a smart home voice interface for the elderly: acceptability and objection aspects. *Pers Ubiquit Comput* **17**, 127–144 (2013). https://doi.org/10.1007/s00779-011-0470-5

36. Seaborn, K., Sawa, Y., & Watanabe, M. (2024). Coimagining the future of voice assistants with cultural sensitivity. Human Behavior and Emerging Technologies, 2024, 1–21. https://doi.org/10.1155/2024/1
37. Kowalski, J., Jaskulska, A., Skorupska, K., Abramczuk, K., Biele, C., & Kopeć, W. (2019). Older adults and voice interaction: A pilot study with Google Home. In Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems (pp. 1–6). ACM.https://doi.org/10.1145/3290607.3312973
38. Kebede, A. S., Ozolins, L. L., Holst, H., & Galvin, K. (2022). Digital engagement of older adults: scoping review. *Journal of Medical Internet Research*, *24*(12), e40192. https://doi.org/10.2196/40192
39. Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis: An expanded sourcebook (2nd ed.). Sage Publications.
40. Prinos, K., Patwari, N., & Power, C. A. (2024). Speaking of accent: A content analysis of accent misconceptions in ASR research. In Proceedings of the 2024 ACM Conference on Fairness, Accountability, and Transparency (pp. 1245–1254). Association for Computing Machinery. https://doi.org/10.1145/3630106.3658969
41. Kim, S., & Choudhury, A. (2021). Exploring older adults' perception and use of smart speaker-based voice assistants: A longitudinal study. Computers in Human Behavior, 124, 106914. https://doi.org/10.1016/j.chb.2021.106914
42. Liu, M., Wang, C., & Hu, J. (2023). Older adults' intention to use voice assistants: Usability and emotional needs. Heliyon, 9(11), e21932. https://doi.org/10.1016/j.heliyon.2023.e21932
43. Zhong, R., & Ma, M. (2022). Effects of communication style, anthropomorphic setting and individual differences on older adults using voice assistants in a health context. BMC Geriatrics, 22, 751. https://doi.org/10.1186/s12877-022-03428-2
44. Bozkurt, A. (2024). GenAI et al.: Cocreation, Authorship, Ownership, Academic Ethics and Integrity in a Time of Generative AI. Open Praxis, 16(1), pp. 1–10. https://doi.org/10.55982/openpraxis.16.1.654
45. Liu, M., Wang, C., & Hu, J. (2023). Older adults' intention to use voice assistants: Usability and emotional needs. *PubMed Central*, *9*(11). https://doi.org/10.1016/j.heliyon.2023.e21932