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Elderly's perceptions of a meaningful interaction with voice-based conversational agents: integrate into daily routines, support relatedness, but do not hamper autonomy

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Voice, as one of the most natural means of communication for the elderly given their declining physical and cognitive abilities, has the potential to reduce interaction barriers with newly emerging technologies. In parallel to this, studies focusing on the elderly as a user group have escalated in academia due to events such as the increasing ageing population and global epidemics like COVID-19. However, the focus has been mostly on their declining mental and physical abilities. This paper aims to investigate the hedonic aspects of Voice-based Conversational Agents (VCAs) for the elderly. In this respect, we conducted in-depth interviews with 13 participants, 9 of whom were elderly over the age of 75, and 4 of whom were caregivers, to examine the daily life practices and values of the elderly together with possibilities of VCAs to create positive experiences in their lives. This paper presents the perspectives of the elderly on VCAs by taking into consideration their perspectives on life and technology. In the end, the paper makes suggestions on which design decisions can support the positive hedonic aspects in the lives of the elderly. Our main finding shows that VCAs can provide a positive experience for the elderly beyond a pragmatic approach if they can be integrated into their daily routines and increase their relatedness with people without harming the areas where they feel competence and autonomy.

Keywords: elderly; voice-based conversational agents; positive user experience; meaningful interaction

1 Introduction

Global population of the "oldest-old", defined as those aged 80 or over, is expected to triple in number from 2015 to 2050, reaching 434 million (WHO, 2015). Therefore, studies on the elderly have been on the rise recently in the field of Human Computer Interaction (HCI). For example, studies are being

carried out in areas such as health technologies and well-being (Sá et al., 2019; Ammar et al., 2021; Liu et al., 2019), the use of mobile technologies by the elderly (Iancu & Iancu, 2020; Awan et al., 2021), interactions with Internet of Things (IoT) (Padikkapparambil et al., 2020; Saile & Navatha, 2022; Tun et al., 2021), design of suitable interfaces for the elderly (Li & Luximon, 2020; Cheng & Sabran, 2021), relationships with games (Rienzo & Cubillos, 2020; Boj et al., 2018), and online shopping (Kovalenko, 2021; Kuoppamäki et al., 2017).

Interaction between Conversational Agents (CAs) and the elderly is another area that recently exhibited an increase in interest. CAs are devices or software that can utilise different modalities like text, speech and video, or other sensory inputs to interact with users (Allouch et al., 2021). Mostly, CAs use natural-language processing, and the accelerating improvement of machine learning makes the personalisation of the CAs more possible (Allouch et al., 2021). CAs focusing on the elderly are prominent in the areas of health and social/mental well-being (e.g. Fadhil, 2018; Clar et al., 2021; Bott et al., 2019), and companionship (e.g., Valtolina & Hu, 2021; Bechade et al., 2019; Hsiao et al., 2020).

Voice constitutes the primary modality in the majority of studies on the elderly and CA interaction (da Paixão Pinto et al., 2021, Stigall & Caine, 2020, Even et al., 2022). Because voice enhances accessibility by making human interaction feel more natural, it has the power to involve the elderly in the use of the latest technological advances (Johnson et al., 2020; Dingler et al., 2021).

Although there is an increase in studies focusing on the interaction between the elderly and Voice-based Conversational Agents (VCAs), the volume of these studies cannot keep up with the population's ageing pace (Sayago et al., 2019). In addition, there are calls that the needs of the elderly are not sufficiently taken into account when designing voice assistants (Cuadra et al., 2022), and the focus of these studies is mostly on pragmatic dimensions, such as usability and functionality with a problem-driven and/or medicalised approach (Leng et al., 2019; Gonzalez-Aguirre et al., 2021; Ring et al. 2013; Fadhil, 2018).

In light of these, this study investigates the possible values VCAs can create beyond a pragmatic perspective by focusing on potential positive experiences for the elderly. To achieve this, this research asks the following questions:

Which elderly values should be considered when designing VCA interactions?

- What are the values beyond the pragmatic perspective that shapes the elderly's perspective on life?
- What values do the elderly attribute to technology?
- What are the design implications of these values on VCAs to provide positive experiences for the elderly?

In the following sections, we first analyse the literature on the elderly-VCA axis, and then, we look at how beyond the pragmatic is addressed in design. After the methodology, we present the findings under three main headings from the perspective of life/technology and VCAs. Finally, we discuss the design implications we propose based on these values, followed by the discussion and conclusion.

2 Related work

After introducing studies in the literature focussing on the relationship between VCAs and the elderly, post-pragmatic paradigms in the field of design will be presented.

2.1 Studies on voice-based conversational agents and elderly

A UNESCO report written by West et al. (2019) confirms a transition period from interactions through text to voice-based communication, which reflects on the market and academia (McTear, 2016). In the market, there are many examples of this technology, such as Amazon's Alexa, Google Home and Apple's Siri for general use, and more specifically, there are also devices for certain purposes like health assistants such as Aiva (Aivahealth.com, n.d).

Besides the mentioned off-the-shelf devices, several studies focus on the relationship between the elderly and VCAs. Considering the elderly's declining mental/physical abilities, dimensions such as usability, loneliness, and health are more prominent, as in their relationships with other technologies. Reviewing an extensive list of resources, da Paixão Pinto et al. (2021) investigated engagement strategies, platforms in which CAs are embedded, modalities, personalisation options and evaluation criteria for VCAs, noting that VCAs are still hampered by limited conversational abilities, fear of reducing autonomy, technical errors and usability problems for the elderly. Chiaradia et al. (2019) emphasised that this negative perception on usability was influenced by the physical/cognitive status and low technological level of the elderly compared to other groups. It is also found that there is no other benefit other than efficiency and convenience in VCA (Kim, 2021) and that the spontaneous-talking problem stands in the way of the companion role, which could have a positive effect (Yamada, et al., 2018).

On the other hand, it is important that voice interaction is evaluated and found advantageous in terms of learnability, usability and comprehensibility (Ziman & Walsh, 2018). Moreover, for the elderly who were perceived to be more vulnerable in terms of social interaction, VCAs were found to help reduce feelings of loneliness by assuming the role of a companion (Corbett et al., 2021; Jones, 2022). The role of companionship is defined in terms of benefits, such as reminders for the elderly, support for domestic activities, and use in emergencies (Tsiourti et al., 2018). Designed to help the elderly fight the feeling of loneliness, chatbots like Charlie can be helpful, reliable and charming (Valtolina & Hu, 2021). In addition, in many similar studies in the field of health, voice assistants are advantageous as a health companion in the health management of the elderly with some diseases such as cognitive impairment, diabetes (Shalini et al., 2019; Cheng et al., 2018; Sezgin et al. 2020, Kobayashi et al., 2019).

In short, VCA-elderly studies have focussed more on pragmatic aspects except companionship, but we know that beyond pragmatic aspects are also important in design. The next section provides information on these.

2.2 Looking at interaction beyond pragmatic perspective

There are current paradigms in the field of design that go beyond pragmatic dimensions, focusing on well-being and positive values. These incorporate concepts such as meaning, motivation, emotions, hedonics, and values. Going beyond pragmatic dimensions and considering affective responses and emotions is important because this approach could help create VCAs that are good at being enjoyable and that make the elderly have feel-good moments and meaningful interactions so that they could have a more positive experience using these technologies (Yang et al., 2019).

When a product, service or system has qualities that will create a bond between its users, it creates meaningful interactions. Therefore, it is necessary for designers to offer more positive and fulfilling experiences by consciously designing products to create more meaningful and valuable interactions for the elderly (Hassenzahl et al., 2013).

In relation to the meaningful interactions, the positive design approach is at the forefront with the main objective of boosting happiness and long-term life satisfaction through design. This is the main goal of the design process rather than just a secondary result, where the purpose is established by its potential to affect "subjective well-being" (Desmet & Pohlmeyer, 2013, p.7).

Well-being focus is also emphasised in Positive Technology and Positive Computing approaches. Positive Technologies advocates for utilising technology to enhance affective quality, engagement, and connectedness of human experiences, with virtual reality environments and software design being common examples used as interventions for mental health and wellbeing (Riva et al., 2012). Calvo and Peters (2014) also focus on promoting wellbeing through Positive Computing by addressing key factors such as self-awareness, compassion, gratitude, and motivation in their design strategies. Their approach involves utilising research on these constructs to inform both the design and evaluation of wellbeing-supportive technologies.

The psychological effect and overall well-being of an individual in relation to a specific technology can be evaluated and optimised through empirical means by focusing on the fundamental psychological requirements outlined in the Self-Determination Theory (SDT) (Peters et al., 2018). According to SDT, people's satisfaction with their psychological needs for competence, relatedness, and autonomy is affected by social and contextual factors (Ryan & Deci, 2017). SDT posits that people are inherently active and social and thrive in supportive environments, but may become vulnerable when basic needs are not met in controlling, rejecting, or negative environments (Ryan & Deci, 2017). It basically argues that when people feel they are competent in doing what they want to do; when people feel connected and belonging to a group; and when they are in control of their own actions, they thrive, otherwise they would feel frustrated.

Within the context of all these concepts in the design literature, which have become more prominent in recent years, this study also focussed on beyond the pragmatic aspects; in doing so, it specifically considered the SDT dimensions. The methodology of the study is detailed below.

3 Methodology

To understand the values held by the elderly, we conducted a study to learn their perspectives on life and technology, and to understand their perception of the prospective use of VCA. We carried out in-depth semi-structured interviews with the elderly and caregivers supported by picture cards and product-specific videos (Figure 1). In the interviews, we questioned both participant groups about the daily routines of the elderly (e.g., shopping, cleaning, hospital) and their interactions with technology through the products they frequently use.

For VCA values beyond the pragmatic ones, we showed existing examples and asked participants' opinions. In this way, we were able to obtain information on the anticipated use. According to Günay

et al. (2022), anticipated use is considered important in the sense that potential users have expectations based on previous encounters with representations of these products in TV series/ films/ science fiction novels, etc., even if they have no experience with a particular product. This study focused on understanding the first impressions of voice assistants and their capabilities to this age group. We selected two introductory videos (dubbed in Turkish) from the pioneers of the voice assistant industry, Google Nest Hub Max (Google Nest, 2019) and Alexa Together (Servicesmobile, 2021), to simulate a wide range of usage scenarios from cake recipe to video call.

Finally, for the elderly participants only, we conducted a free association activity with picture cards. We used the picture cards as a tool to help the participants recall real-life stories and to stimulate memories and experiences to share (Hanington & Martin, 2019). Although this method has generally been used in the literature with children to facilitate the expression of nonverbal behaviours and emotional states (Barendregt & Bekker, 2005; Desiree, 2018), when used with the elderly, it may have the effect of alleviating some of the negative factors associated with ageing. Also, encouraging elderly to discuss diverse topics can help them remember and reflect on activities they enjoy. So, picture cards in our study included various themes such as different locations (shopping malls, parks, hospitals), different activities (birthdays, dinners, games), and different close relationships (husband-wife, elderly-grandson, mother/father-child). The images were collated from the publicly available resources from the Internet. Due to possible copyright issues, they are not presented in this paper.

Figure 1. A photograph during an interview.

3.1 Sampling

In the study, interviews were conducted with two separate groups: elderly over 75 years and caregivers. The lower limit was set as 75, because there could be more room for improvement in the lives of those aged 75+, considering deterioration in their mental/physical health. In addition, especially in the 75+ age group, since carers/support providers support the elderly in many areas of daily life, caregivers are also included to enrich the outputs of the study by providing important insights in line with their needs/wants.

In this study, purposive sampling was the main sampling method, which is deliberately choosing interviewees based on their capacity to explicate a certain topic, concept, or phenomenon (Robinson, 2014). Due to the exploratory nature of the study, we aimed at maintaining diversity within a small sample size. To ensure diversity, in the case of the elderly, attention was paid to (1) whether they live

alone, with someone or in a nursing home, (2) whether they can meet their own needs or receive support. For caregivers, attention was paid to having different levels of closeness with the elderly (professional/family member or caring for elderly's weekly/daily needs). Also, snowball sampling, where participants who trusted the researcher recommended the study to their acquaintances, was used as an auxiliary method due to the hesitation of this age group to participate in the study.

We interviewed a total of 13 participants, whose actual names were replaced by pseudonyms: 9 elderlies (Table 1), 4 caregivers (Table 2).

Table 1. Background of the elderly participants

Participant (Pseudonym)	Age	Marriage Status	Education Level	Household Condition	Support	Health Condition
Alex	77	Surviving spouse	Vocational Certificate Programme	Alone	No support received	* Knee Pain * Hypertension * Panic Attack * Migraine * Rheumatic Pain
Amy	81	Surviving spouse	Secondary School Graduate	Alone	Domestic helper for cleaning	* Hypertension * Thyroid Disease * Hearing Problems
Kelly	89	Surviving spouse	Vocational Certificate Programme	Alone	Domestic helper for cleaning	* Visual Problems * Knee Pain * Hypertension * Asthma
Sheila	86	Surviving spouse	Vocational Certificate Programme	Alone	No support received	* Hypertension
Valencia	80	Surviving spouse	High School Graduate	Living in nursing home	Needs met by the nursing home	* Hypertension * Diabetes
Ursula	86	Surviving spouse	High School Graduate	Alone	Domestic helper for cleaning and personal care	* Hypertension * Knee Pain * Visual Problems * Gout
Steve	96	Surviving spouse	Undergraduate	Alone	Domestic helper for cleaning	* Hearing Problems * Prostate Gland
Tina	77	Married (Gregor's wife)	Undergraduate	Living with spouse	Domestic helper for cleaning	* Hypertension * Knee Pain
Gregor	85	Married (Tina's Husband)	Master's Degree	Living with wife	Domestic helper for cleaning	* Hypertension * Knee Pain * Heart Disease

Table 2. Background of the caregivers

Participant (Pseudonym)	Occupation	Meeting Frequency	Relationship with the Care Receiver	Age of the Care Receiver	Health Condition of the Caretaker
Maria	Day labourer	Once a week	Domestic Helper	86	Hypertension Knee Pain Visual Problems Gout
Laura	Retired teacher	Demand-dependent	Daughter	84 (Mother) 94 (Father)	Her Mother: Diabetes Hypertension Cholesterol Visual Problems Her Father: Dementia, Hypertension
Michael	Physiotherapist	Demand-dependent	Professional caregiver	50+	Hypertension Diabetes Cancer Dementia Visual Problems Paralysis
Jessica	Retired teacher	Living together	Daughter	91	Hearing Problems Hypertension Dementia Bone Loss

3.2 Analysis

Interview audio recordings were first transcribed verbatim. After, we performed two coding cycles in Microsoft Office Excel. In the first cycle, we used the SDT dimensions (competence, autonomy, relatedness) deductively as a start list. We also added codes for the technology and VCA approaches of the elderly, and we adopted an inductive coding approach to identify participants' perspectives towards life/technology and VCAs (Saldana, 2016). In the second cycle, the final themes were formed by focusing on the hedonic dimensions that emerged in the first cycle. Finally, these codes were grouped into main themes below with the participants' pseudonyms (Table 3). In this process, to maintain analyst triangulation (Patton 1990; Denzin 1978), all authors reviewed the interview texts and reached a consensus on the list of codes. Then, the first author concluded the coding process. The following section scrutinises the research findings by elaborating on the themes identified in the study.

Table 3. Obtained themes

Theme	Sub-Theme	Participants
Perspective on Life	Self-sufficiency till death	(Elderly: Alex,77; Amy, 81; Kelly, 89; Sheila, 86; Valencia, 80; Ursula, 86; Steve, 96; Tina, 77; Gregor, 85) (Caregivers: Michael, Jessica)
	Independency	(Elderly: Valencia, 80; Kelly, 89; Ursula, 86) (Caregivers: Laura, Michael)

	Connectedness	(Elderly: Alex, 77; Amy, 81; Kelly, 89; Sheila, 86; Valencia, 80; Ursula, 86; Steve, 96; Tina,77; Gregor, 85) (Caregivers: Michael, Jessica, Laura, Maria)
	Self-esteem	(Elderly: Alex,77; Amy, 81; Kelly, 89; Sheila, 86; Steve, 96) (Caregiver Maria)
	Open to learning	(Elderly: Alex,77; Amy, 81; Valencia, 80; Ursula, 86; Steve, 96; Gregor, 85) (Caregiver Maria)
	Stay active	(Elderly: Sheila, 86; Valencia ,80; Ursula,86; Steve, 96) (Caregiver Michael)
Perspective on Technology	Staying in touch with the inner circle	(Elderly: Steve, 96; Kelly, 89; Amy, 81; Sheila, 86; Valencia, 80; Ursula, 86; Steve, 96; Tina, 77; Gregor, 85) (Caregivers: Laura, Jessica, Maria)
	Keeping the fun and seeking the partner	(Elderly: Alex, 77; Amy, 81; Sheila, 86; Valencia, 80; Ursula, 86; Steve, 96; Tina, 77) (Caregivers: Michael, Laura)
	Keeping everything as it is if novelty is not useful	(Elderly: Amy, 81; Kelly, 89; Sheila, 86; Ursula, 86; Steve, 96; Tina, 77;) (Caregivers: Laura, Michael)
	Being protected from strangers and unfamiliar abilities of the technological products	(Elderly: Alex, 77; Amy, 81; Kelly, 89; Ursula, 86; Steve, 96; Tina, 77; Gregor, 85) (Caregivers: Michael, Jessica, Laura)
Perspective on VCA	Companionship	(Elderly: Steve, 96; Kelly, 89; Amy, 81; Valencia, 80; Ursula, 86; Steve, 96; Tina,77) (Caregivers: Laura, Jessica)
	Concerns about losing competence	(Elderly: Steve, 96; Sheila; 86; Amy, 81; Kelly; 89; Tina, 77) (Caregivers: Laura, Michael)
	Scepticism about usefulness	(Elderly: Alex, 77; Tina; 77; Gregor, 85; Sheila, 86; Ursula, 80) (Caregivers: Michael, Maria, Jessica)
	Limitedness to talking	(Elderly: Ursula, 86) (Caregivers: Laura, Jessica, Maria)

4 Findings

With the aim of creating meaningful interactions in the lives of the elderly and to understand what the participants value and how these would affect a possible VCA experience, the emerging themes during the interviews were categorised under 3 main headings: perspective on life, perspective on technology, and perspective on VCAs. Each of these are explained below, by referring to the sub-themes in Table 3.

4.1 Perspective on Life

Understanding the perspectives on life is crucial to better address the needs, potentials, and values that could help position VCAs in elderly users' lives beyond a pragmatic perspective. To make sense of the reasons underlying the participants' perspectives on life, it would be meaningful to briefly mention the areas in which they felt they were/were not competent. For the majority of the participants, the primary element in the way they perceived life was the motivation to be self-sufficient. When we look at the ways in which participants express self-sufficiency, they want to stand on their own feet and

meet both emotionally and physically their basic needs, and not to be in need of care from someone else (like a bedridden patient). Likewise, they express their competencies primarily in terms of meeting their basic needs. Participants mostly perceived themselves as competent in household work (preparing and eating meals), meeting their needs in areas nearby the home (going to the market/pharmacy), meeting their own hygiene (toilets and showers)/care needs, and personal daily health needs routines (like tracking medications).

Apart from meeting their own needs, their physical abilities seem to decrease over time or due to negative experiences (like falls). Participants who experienced this fear of falling and movement stated that they needed someone for their needs outside the home (like shopping) and had to wait for their availability. However, they do not want to create dependency on other people.

Almost all of the participants saw that connectedness with people in a close relationship has a great impact on their positive outlook on life. When describing their happiest times, most of them described these relationships through their children/grandchildren/siblings, and neighbours. This relationship is also welcomed by the caregivers. When describing their favourite activities with the elderly person they care for, many of them said that they enjoy talking to the elderly person and listening to the stories. However, almost all participants (including those having close family relationships) emphasised the emptiness and weakening of social relationships in their lives after the pandemic.

The importance of self-confidence in this age group often comes to the fore when they talk about both their physical and technological abilities. Many of them stated that they could use other features of technological devices (especially through the use of smartphones) if they wanted to, and that they had this self-confidence. For the things they can already do, they commented that they are good for their age. As a reflection of the elderly's self-esteem, they described themselves with adjectives such as "open to learn" and "curious".

The participants touched upon the importance of an active life, physically and mentally, which is seen as the source of being able to be self-sufficient. Most of the participants emphasised physical activity such as setting daily step goals, doing sports, paying attention to daily water consumption, as well as the mental activity of playing games (Steve, 96; Sheila, 86; Valencia, 80; Ursula, 86). Both physical and cognitive abilities can be exemplified as follows:

> *I can't walk [outside] because I suffer a lot from my knees, but I walk around the table at home. I try to take 2000 steps or something, just to keep moving. [... To calculate 2000 steps,] I'm counting forty steps [around the table]. I walk around ten times each. Four times five [times in a day] is twenty. That's 2000 steps.* (Ursula, 86)

4.2 Perspective on Technology

In this section, participants' thoughts about the place of technology in the lives of elderly are grouped into four categories.

4.2.1 Staying in touch with the inner circle

Elderly participants have a close network of loved ones and people who can be there for them in times of need. The phone has an important place in communicating with their close environment for some of their needs. They are in regular communication with certain people such as the staff of a grocery store and the staff at the apartment building.

Additionally, regarding the participants' motivations for use, the primary purpose is to communicate with their loved ones in their daily routine. Talking on the phone, making video calls, and messaging with siblings/children/loved ones were frequently mentioned.

4.2.2 Keeping the fun and seeking the partner

After the basic needs, participants mentioned that they use technology for entertainment-oriented activities or to relieve boredom such as listening to classical music on the radio, playing games, and watching many different types of programs on TV. Among them, especially the central role of TV as a companion is at the forefront. Ursula (86) also mentioned that her radio has a role similar to a friend.

4.2.3 Keeping everything as it is if novelty is not useful

Another motivation worth discussing is that the participants mostly aimed to benefit from technological products and seek practicality, in line with the features they used. It is remarkable that when ease of use is not provided, users choose to protect their habit, or they use only the basic features or completely give up using the devices. The caregivers provided their own solutions to various problems, such as colour codes or icons on the washing machine. For example, caregiver Maria marked the washing program for white and coloured clothes with blue nail polish, while caregiver Laura put adhesive stickers on the remote control to turn the sound on/off and on the frequently used programs on the washing machine (Figure 2).

Figure 2. Sticker examples.

Therefore, feeling the necessity/obligation is a breaking point in their communication with the new technological products or their features. When these conditions are not met, it is seen that participants continue their habits.

4.2.4 Being protected from strangers and unfamiliar abilities of the technological products

Another issue is security concerns. Two participants brought their problems related to it. Caregiver Jessica stated that she no longer leaves her phone at home because she thinks that the elderly person she cares for can be easily deceived by strangers who call her on the phone because she believes everything they say; and that if her mother is going to call someone, she refers to be the intermediary in this regard.

Also, the reliability of technological products is emphasised. When the products do not fit into their logic, they keep their distance from things that they cannot comprehend.

Similarly, caregiver Michael stated that the participants write down the numbers in a notebook rather than on the phone because they are not familiar with the product and its capabilities, but they are sure that the notebook would not be lost, and they know how to keep/protect the information in the notebook. This situation also brings with it concerns such as participants being afraid of making mistakes, the system crashing/breaking down, and running out of battery (Tina, 77).

4.3 Perspective on VCAs

In this section, the reactions of the participants after watching the VCA videos are presented under four categories.

4.3.1 Companionship

As revealed in the perspectives on life section, elderly's relationships have a dominant role in their life. In relation to those findings, the majority of the participants stated that they see VCAs as friends because they could communicate with them by voice and video.

> *Of course, I did [like voice communication]. It's like talking to someone, like a friend. [...] I mean, if I could use it, I would buy it. No one shows me anything like that*. (Kelly, 89)

Similarly, Steve (96) stated that he could use it to meet his daughter and granddaughter, as he had no one left to talk to and share old family stories with. Therefore, the elderly generally attach importance to moments/close relationships that they find important. A striking opinion supporting the importance of memories is as follows:

> *I threw all the pictures in the garbage. I tore up all the old childhood pictures, all the pictures of youth. I said, after I die, they will be lying around like this. I'd better put them in their place so that they will disappear.* (Ursula, 86)

Other participants also shared some of their positive views about feeling not alone or feeling connected to their loved ones. For example, the video of the granddaughter and grandmother making a video call evoked the possibility that the participant living in the nursing home could communicate with her sisters without having to go downstairs. Caregivers stated that they can communicate with this product, especially when they are far away. Caregiver Jessica, who is currently watching her mother with a remote camera, emphasised that thanks to this product, perhaps she could even chat with her mother remotely. Another Caregiver Laura stated that the product could perhaps be a conversation partner for her patient with dementia, and that the speech ability of the product is very important, especially for such patients not to forget how to make sentences and words.

Additionally, the connection with the past is not limited to loved ones. Caregiver Michael put it this way: "*We talk most about their youth, their old habits, when they were good, when they could take care of their own needs"* (Michael).

4.3.2 Concerns about losing competence

Although many of the participants liked VCA as a first reaction, they did not need it with the existing features because they were able to do their own work as a reflection of being self-sufficient. Also, they mentioned that this product might appeal to sicker, bedridden people, but they were afraid that it might make physically fit people become lazy, and emphasised that the elderly need to be active.

4.3.3 Scepticism about usefulness

The expectation of usefulness was also found to affect their perspective on VCA. For this reason, elderly participants tend to incorporate a technology or product into their lives if it is useful, otherwise they prefer to maintain their existing habits.

> *I didn't see a benefit like this. I mean, I will say open and close, there is something to open it with my hand. So, we have buttons. We have remote controls. I don't know*. (Tina, 77)

Although Tina (77) stated that she was open to innovations and that these technological innovations were better, she defined this product and what it could do as a luxury for people in her age group.

Though the importance of voice communication is emphasised in the Companionship section, some caregivers thought that using only voice may not be sufficient or may address a limited audience. Having something in a written form can trigger feelings of trust as it gives them a sense that it will be more permanent and is a more familiar way of use (Michael, Laura; Tina, 77). Some of the solutions/shortcuts previously created to facilitate the interaction of the elderly with technological products are also shared to overcome the negative effects of voice communication. Similarly, examples were given for VCAs like using the buttons for some of its basic features, such as on/off switches, and some functions being converted into a numeric value (e.g. press 1 to turn on the lamp, press 2 to turn it off) (Michael). In addition, Tina (77) stated that although she knew the wording in the product (such as "Log in"), she did not know what it meant in that context, which led to confusion and made it difficult to use.

4.3.4 Limitedness to talking

Although the voice assistant was generally welcomed by the participants, they underlined the limitations of the voice assistant in terms of location and capabilities. Firstly, when looking at the spatial dimension, the VCA should be portable, especially if it is to play a role in emergencies, similar to the motivation to carry the phone with them all the time because they are afraid of falling.

Secondly, for some of the participants, the desired technological product is more than a voice assistant. There is also a relationship with the participant's perspective on life. For example, Ursula (86), who felt inadequate in many areas and received support for her basic needs, explained as follow:

> *What good is it if it provides the recipe but does not cook? That is where the issue is. For example, I can't peel a potato, I can't chop an onion. This one will do it, but you will prepare it. It will do it.* (Ursula, 86)

With similar concerns, two caregivers (Jessica, Maria) expressed that they would rather think of a robot or a real person. Jessica stated that she needed to have someone to communicate with as she was afraid of the product failing and could not trust it. Similarly, caregiver Laura suggested using more human-like features in the design of a humanoid robot to make it friendlier. She underlined that these products should be tailor-made (if any, by considering the needs related to the chronic disease) and for this, it would be important to design and act together with caregivers.

5 Discussion

Based on the perspectives of the elderly and carers, we identified nine design implications for developing VCAs that can meet the elderly's values beyond the pragmatic features. These implications

are grouped into three main dimensions: be a better part of elderly's life, be more reliable and patient, and be more social.

In Figure 3, these nine design implications are summarised in three main dimensions.

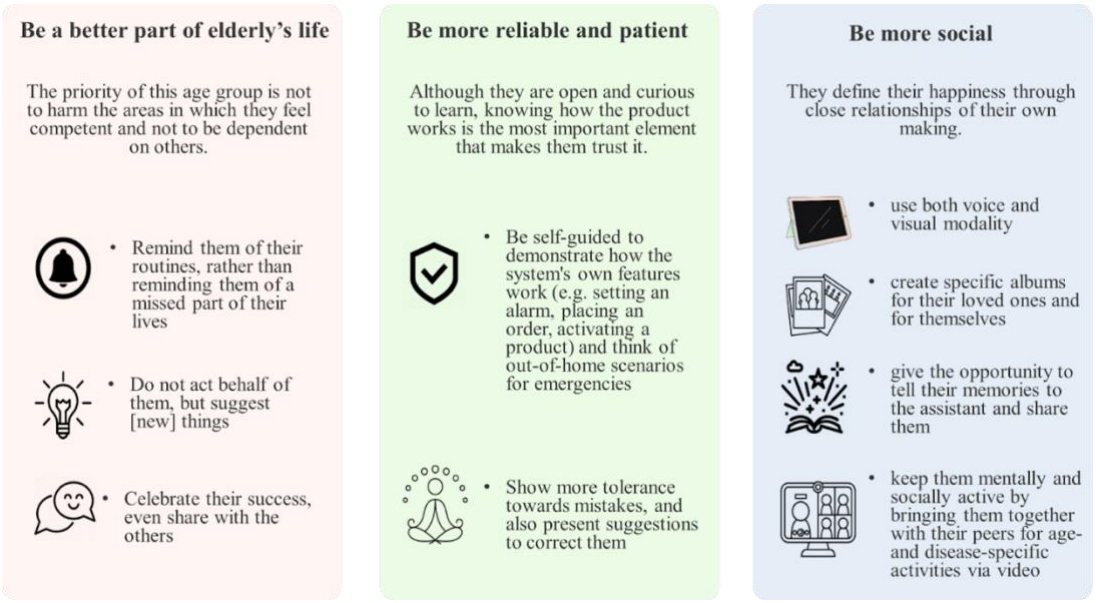

Figure 3. Design implications showing the desired characteristics of VCA beyond the pragmatic perspective.

5.1 Be a better part of elderly's life

As parallel to the literature (Portet et al., 2013; Martin-Hammond et al., 2019; Günay, 2022), the elderly's concern about being pushed into laziness and being dependent on a device affects their perspectives. Hence, it is important that design decisions are shaped without harming the areas where they feel competent and independent. In scenarios such as reminding the medication and making a shopping list, the participants questioned the benefit they would receive from the product by thinking that they could do these themselves. Therefore, the VCA can maintain the order created by the elderly and be involved in their routines: reminding their medication and healthy life routine rather than a simple alarm for the medicine time, reducing their dependency on others with a shareable shopping list, adapting to the other technological products/phone to help them with the features they feel inadequate for and showing them the potential options available instead of acting behalf of them. Secondly, recording, celebrating and even sharing their achievements with others can be used as a driving force to ensure the continuity of these positive behaviours. This is because of the effect of comparing oneself with others on competence, which is an important psychological need (Ryan & Deci, 2017).

5.2 Be more reliable and patient

In the study, it was noteworthy that the elderly defined themselves as open to learning and curious. However, as seen in the literature (Chung et al., 2021; Kim, 2021; Corbett et al., 2021), not understanding how the voice assistant works creates a barrier to this curiosity and leads to trust issues. Therefore, caregivers associated age-related factors such as forgetfulness and repetition of questions with the patience of the product. Taking advantage of their desire to learn, introducing the system's own features (e.g., setting an alarm, placing an order, activating a product) and being instructive can reduce their dependence on others for use and increase positive perception. Moreover, showing

tolerance towards mistakes and providing instructions on how to return from mistakes may encourage the use of the product by preventing situations such as making mistakes and giving up using the product. There is also a relationship between trust and actions in emergencies (Portet et al., 2013). As mentioned before, participants emphasised the portability of this product for people who live alone, perhaps for their loved ones to monitor their home in case of emergencies, for caregivers with bedridden patients to communicate remotely, or for scenarios that take place completely outside the home (such as calling the previously given hospital number).

5.3 Be more social

Elderly's attachment to the past, desire to share memories, and recalling positive memories are instances that will nurture competence and relatedness. Talking about nostalgia is an enjoyable activity for both the elderly and caregivers. Therefore, it may be appropriate to consider the effects of the screen/visual on this age group when making design decisions. From this point of view, preparing special albums for different people (kids, spouse/wife, grandchildren) or important events (like travel memories) through a smart assistant, and accessing them at any time with a simple voice command can be important. The chance to tell the memory that comes to their mind about the picture to the smart assistant, or to convey it to their loved ones/people they see close to them, and to know that their experiences are still important can give new hope for life. In this way, having photos or videos of themselves can also provide an opportunity to revive their memories, to rediscover their own abilities. Parallel to the companionship role often attributed to VCAs (Tsiourti et al., 2018, Corbett et al., 2021; Duque et al., 2021), for the elderly who usually spend time at home, it may be important to turn the VCA into a more social product. Considering chronic illnesses (e.g., word games for patients with dementia as mentioned earlier), it may be useful for them to turn the VCA into a playmate. It can make life at home more fun and active, such as bringing peers together in an online environment and sharing their achievements with each other.

It was seen that these dimensions can also be related to SDT. It was found that being a part of their daily lives could increase elderly's competence, being more reliable and patient could increase their autonomy, and being more social VCA could increase their relatedness (Figure 4).

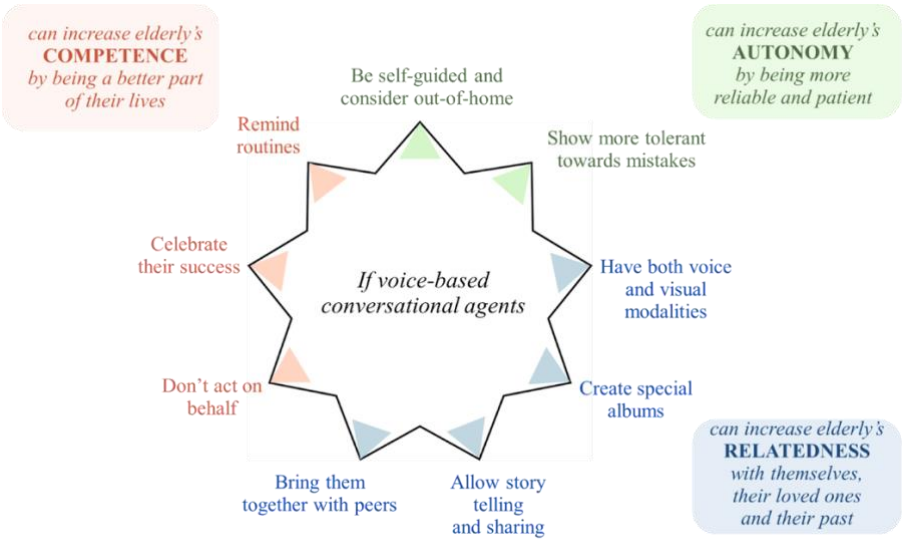

Figure 4. The relationship between hedonic characteristics of VCAs and SDT components.

5.4 Limitations and further suggestions

This study provides fruitful insights on how users aged 75+ may benefit VCAs beyond the pragmatic perspective. However, our participants were from upper socio-economic levels, who are mostly educated and have experience with such digital devices as smartphones. This sampling frame might have limited our observations on hedonic values that may be attached to VCAs. Therefore, future studies can consider interviewing participants from different backgrounds, particularly less privileged elderly groups. Additionally, in the study, the physical characteristics that fundamentally affect the daily life dynamics and care needs of the elderly were clearly stated by considering diversity in every aspect. However, we acknowledge that individual characteristics such as innate temperament, personality traits and background factors affect these dynamics. Therefore, economic, social, psychological differences/uniquenesses can also be addressed in future studies.

Finally, as Turkish versions of voice assistants were not available in the study, they could not be directly experienced by the participants; instead, they were evaluated using scenario videos. Therefore, it is necessary to observe the interactions of +75 with real VCA for a more holistic view. Moreover, future studies can focus on the positive value-added aspects of current assistants, and the extent to which their positive value perceptions overlap with the study.

6 Conclusion

Studies on the elderly and their interactions with voice technology and voice-based products in the market are expected to gain momentum with the increase in the elderly population. However, the fact that these developments majorly address pragmatic dimensions may prevent them from being supported by sustainable, change-inducing behaviours in the lives of the elderly. For this reason, it is important to identify characteristic features that can correspond to user values beyond the pragmatic. In addition to the voice assistant focus, we questioned the meaningful interactions that the elderly attribute to their lives and to technology in general. Based on the interviews with the elderly aged 75+ and carers in Turkey, we found out that the areas where the elderly feel autonomous and competence were the first dimension to be underlined when making future design decisions. Additionally, the relatedness they develop with their close environment, their families and even sometimes with themselves is one of the most important factors that enable them to hold on to life. However, while transforming these into design decisions, age-related forgetfulness, expected usage habits and meaningful use scenarios should be taken into consideration. The most important contribution of this study is to associate the decisions to be made in VCA design with the corresponding values in the lives of the elderly.

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