Cyprus University of Technology

TALLINN UNIVERSITY

**Master's Thesis**

# Augmented Reality wearable device for improving quality of life targeted to elderly people or patients with Mild Cognitive Impairment (MCI)

**Iisa Amalia Michael**

**Limassol, May 2021**

CYPRUS UNIVERSITY OF TECHNOLOGY

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# Approval Form

Master's Thesis

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Presented by

Iisa Amalia Michael

Supervisor: Faculty Name Surname and position

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Limassol, May 2021

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## ABSTRACT

Augmented Reality (AR) provides tremendous potential for almost every aspect of our lives. Especially in the science, medical and healthcare industry, where such technology could be revolutionary. In recent years, an increasing number of partnerships between technology and healthcare corporations are on the rise, bringing emerging technologies to advance traditional processes aimed at improving the entire healthcare ecosystem. A mixed reality environment is a promising concept, as it provides opportunities for both doctors and patients. AR technology's widespread adoption in the healthcare industry, as its practical applications assist doctors and caregivers in their challenging work, as well as patients eliminating their barriers in their everyday life activities. The primary goal of this research study was to develop a proof of concept of an AR application that assists elderly people or mild cognitive impaired patients in their day-to-day activities. The targeted audience are in the epicenter of this study, through a user-centered design approach. This process involves the stakeholders through every phase of the prototype's design and development. Participatory design sessions have been conducted, in order to collect valuable feedback directly from the targeted audience. Via a variety of research and design methods, this research work aims to deliver a highly usable and accessible product for the targeted audience.

The expected outcome will be an AR proof of concept which aims to provide emerging forms of interaction within domestic spaces to improve care and the quality of life of those people. The development and evaluation of this AR prototype will provide input for future systems not only focused on the medical industry, as it might produce valuable insights on solutions supported by augmented reality in a wider aspect of HCI platforms.



**Keywords**: Mild-cognitive Impairment, Dementia, Augmented Reality, Mixed-environments, Wearables

# TABLE OF CONTENTS

## LIST OF FIGURES

## LIST OF ABBREVIATIONS

| | |
|---|---|
| AR: | Augmented Reality |
| VR: | Virtual Reality |
| MCI: | Mild Cognitive Impairment |
| UI: | User Interface |

# 1 Introduction

During the last decade, there was an increasing awareness of Alzheimer's disease and other memory loss related medical conditions (Burns & Zaudig, 2002). The significance of continuing improving existing medical or healthcare related Augmented Reality (AR) or Virtual Reality (VR) systems is highlighted by the current tendency of developing such systems, platforms or applications considering the continuous evolution of immersive or semi-immersive environments (García-Betances et al., 2015).

Utilising the tremendous power of Augmented Reality, there exists an opportunity to advance processes and approaches within the medical and healthcare fields. This proposal details how an AR application can assist elders or patients diagnosed with Mild Cognitive Impairment (MCI) to perform exceedingly well on a specific task independently. Within this scope, this study seeks to observe, gather data both quantitatively and qualitatively and propose a user-centric design oriented solution aiming to improve patients experience and eliminate caregivers' challenges they may encounter.

# 2 Problem Statement

As research around the development of Augmented Reality platforms is extensively expanding, there is a significant potential in integrating such emerging technologies to forge ahead medical and healthcare industries. This case study will investigate the elders' and MCI patients' behaviour towards an AR application that aims to assist them in their every-day life activities.

In general, caregivers provide basic assistance to MCI patients, performing a wide variety of tasks, such as giving medication, helping them to take a bath or with grocery shopping. In fact, this continuous caregiving is required forever, it can potentially take an emotional, physical or financial toll on patents' families. Innovation and technology are rapidly evolving, allowing people perform such tasks more efficiently and effectively. This study investigates the possibilities leveraging such technologies to develop an innovative solution for eliminating whatever barriers patients and caregivers face.

In approaching this dissertation, a hypothesis was formulated around the previously mentioned area to reflect some of the potential challenges both the patients and caregivers

encounter. This will help patients to act independently, thus putting them in a good position to keep a stable health status and improving their medical condition interacting in a mixed environment.

The study will focus on the above-mentioned stakeholders, examine their behaviour and propose a solution that influences their involvement and efficiency of specific activities while interacting with mixed environments. This research study will attempt to answer how their cognitive state may affect their interaction with such applications, as well as on what scale their initial attitudes towards those activities tend to change after an extensive interaction with the AR prototype. A future investigation could be how their initial attitudes towards those activities tend to change after a certain period of time.

Thus, based on the preliminary literature review, it appears an interesting question to be formed that is worth exploring further: how to design an AR system for the betterment of the quality of life of elderly people or patients diagnosed with Mild cognitive impairment. In arriving at the research questions, this study seeks to understand the behaviour of the above-mentioned stakeholders, the challenges facing them in their day-to-day activities and the view of their caregivers on the patient's current medical state.

# 3 Literature review

## 3.1 Literature review preparation

The literature review is a vital phase in the research process. The existing major theories, approaches and methodologies of exploring cognitive impairments in an AR context will be described, compared and contrasted, giving an overview of the current literature on the topic and supporting the defined research questions. An extensive comparison of various arguments and findings related to the topic of interest will be analysed. The selected material will be divided into two sections that investigate the topic in a medical perspective and HCI in an AR context. The review will be an in-depth analysis on the enriched immersive experience in mixed environments.

## 3.2 Paper selection

The research sources span across textbooks, academic journals, and discussions investigating the involvement of Augmented reality in a medical and healthcare context. Research papers have been sourced from prestige sources and written by academic professionals with high reputation. The selected literature is most relevant with the selected topic, as they should be authoritative to support the argument and findings of this research work.

Material and resources is being collected by searching in Google Scholar and the Cyprus University of Technology (CUT) online library database the following keywords (preferably or if it's possible a combination of them): "Mild Cognitive Impairment", "Demencia", "Augmented Reality", "Immersive Technology", "Memory Loss", "Mixed Environments", "Augmented Reality Systems", "Domestic Systems", "Smart Home Systems".

## 3.3 Time frame

All relevant research should be included regardless of date. Recent research work that is relevant and highly cited will have a greater value due to the rapid development of the chosen area and domain, as the development of AR systems is a relatively new area that is still evolving. However, older articles that might have important information for understanding the evolution of immersive technologies and their impact on patients diagnosed with a memory loss related disease in any aspect would not be excluded.

## 3.4 Theoretical Background

### 3.4.1 Definition of HCI

To approach this topic, it is important to have an extensive knowledge of the targeted population. Having a deeper understanding of the behavioral traits of the targeted audience will serve the purpose of the study. As stated before, the target audience are elderly people and people with Mild cognitive impairment. According to Gauthier et al. (2006), Mild cognitive impairment is a syndrome defined as cognitive decline and has a high risk of progressing to Alzheimer's disease. It is a neurological disorder. Older people are often diagnosed with MCI which is a stage between the expected cognitive decline of normal aging

and the more serious decline of dementia. It can involve problems with memory, language, thinking and judgment that are greater than normal age-related changes. (Flicker et al., 1991).

Noticeable signs including a cognitive deterioration and the inability for an individual to perform daily activities as they are perceived as complex. It is common for patients with MCI to experience behavioural changes as there is evidence of anxiety, depression, irritability, and apathy (Gauthier et al. (2006).

Several treatment methods that are being used to treat Alzheimer's disease, have been tested in mild cognitive impaired patients, assist in stabilising the disease, and preventing or delaying other functional disabilities, such as dementia. Individuals who are diagnosed with MCI have a high risk of developing dementia however, identifying the symptoms at the beginning can reduce the possibility of being diagnosed with dementia at a later stage. Non-drug approaches are vital for these particular stages, as utilising the current technology can minimise the chances of aggravating the disease (Burns & Zaudig, 2002).

Estimates suggest that up to 20% of adults over age 70 years may have Mild Cognitive Impairment (McDade et al, 2014). This is a tremendous percentage of people who will not be able to take care of themselves. With the help of supportive devices, these people will be able to interact more effectively with their surroundings and have the maximum possible control of their environment.

### 3.4.2 Living with Mild Cognitive Impairment

Mild cognitive impairment is a condition established as more extensive than the expected cognitive decline for an individual (Gauthier et al, 2006). Prichard determined the earliest stages of dementia as impairment of latest memories with intact remote memories (Prichard, 1837).

The main symptoms of dementia were reported to be short term memory loss, impaired communication and problem solving and thinking difficulties. The daily tasks can become frustrating, but with the appropriate verbal assistance, patients can facilitate daily tasks independently.

### 3.4.3 Barriers faced by caregivers or families providing assistance to MCI patients

It is often observed a phenomenon called “Caregiver burden”, while this phenomenon regarding dementia or other memory-related diseases has been investigated extensively in the academic context (Paradise et al, 2015). This phenomenon is associated either with the care receivers’ or caregivers' characteristics, or the caregiving context (Burns & Rabins, 2000). Caregiver’s stress levels and health is highly impacted when they stand unable to access any support for their loved ones. They are going through burnout, not only because of the physical tasks they need to perform in order to care for the patient, but they have a strong feeling of grief because of their patient's current state of health (Woolmore-Goodwin et al., 2016).

Woolmore-Goodwin et al. (2016), used phenomenology to gain a deeper understanding of the lived experience of a MCI patient and their caregiver. The core essence of this study was that carers mentioned that they were less autonomous in decision making, as the lack of control occurred considering the patients needs. Furthermore, individuals who took care of their loved ones stated that their relationship between them and the MCI patient were redefined. The change was frightening and overwhelming, as the communication between them would dramatically change after the diagnosis (Woolmore-Goodwin et al., 2016).

### 3.4.4 How AR applications can assist MCI patients

Recent research work implies that there is a great value of utilising Augmented reality technology in medical purposes, especially in memory-loss related diseases. According to García-Betances et al (2015), augmented reality is superimposing virtual elements into the physical world using electronic vision devices such as cameras and smartphones. This way it creates an enchanting environment where a digital layer is perceived by users in their physical location - contrarily to Virtual Reality systems that provide a fully immersive experience.

García-Betances et al., 2015) suggest that a vital feature that must be provided in these AR or VR systems, would be the collection of psychophysiological data. Heart rate, variability, state recognition, and cognitive stress are some of the patients’ performance data that would provide useful information illustrating their performance evolution and state.

Assistive systems and technology that are simple to use as well as affordable will provide advances not only to the patient directly, but to the caregivers and families as well. In-home

and nursing environments would be enriched by future innovation and will significantly contribute to the stability and betterment of patients' health (García-Betances et al., 2015).

### 3.4.5 Mixed reality related work

Recent research work implies that there is a great value of utilising Augmented reality technology in medical purposes, especially in memory-loss related diseases. There are a few examples that medical mixed reality applications were designed and developed for cognitive training and recuperation of patients diagnosed with Alzheimer's disease (Quintana and Favela, 2013).

Aruanno et al. (2017) developed a semi-immersive experience called MemHolo. A head-mounted wearable device that projected holographic objects into the real world, was used as a therapeutic tool for people affected by Alzheimer's Disease. There were developed a set of activities, such as short term memory activity and memory game with spatial mapping. MemHolo was overall a pleasant and well accepted experience for the targeted audience, however the technology used was advanced for them.

Kalová et al. (2015), attempted to solve subjective problems with memory and concentration focusing on sequential ordering of places, allothetic orientation, spatial navigation and non-verbal episodic memory. Optale et al. (2010), used a set of tasks to improve memory functions. Those included "matching", "pacing", and "leading". The experience was approached with creative music therapy, to encourage participants to sign and play a variety of musical instruments.

Another example of mixed environment methods developed a gamified experience that was evaluated by healthy elderly and MCI patients to diagnose the MCI disease, test their cognitive performance and topographic orientation (Shamsuddin et al., 2012).

# 4 Research Goal

## 4.1 Objectives

The goal of this Master's dissertation is to contribute knowledge, approaches, and methodologies for the advancement of the medical and healthcare field of industry in an Augmented Reality context. Through user-centered design methods, this dissertation should

produce an AR solution that would be integrated into elderly people's or mild cognitive impairment patients' everyday life, focusing on the quality of their life's improvement. It will also contribute a significant value to the caregiver's and families' interaction with patients. In approaching the formerly mentioned statements, the main objectives of this research study are stated below:

***Main Objective:*** Design and develop an AR prototype that aims to provide a solution to a design problem within the healthcare industry, targeted to eldrerly people and patients diagnosed with Mild Cognitive Impairment.

- ***Obj 1:*** Evaluate the effectiveness of an AR prototype aiming to provide a solution to a design problem within the healthcare industry.
- ***Obj 2:*** Provide additional insights on how to design in an AR context.

## 4.2 Research Questions and hypotheses

Based on the above-mentioned objectives, a main research question and two sub-research questions are defined as:

***Main Research Question:*** How can Augmented Reality assist elderly people or mild cognitive impairment patients in their day-to-day life?

- ***Sub Research Question 1:*** How can we design and develop an AR solution to support elderly people or mild cognitive impairment patients in an Smart Home environment context?
- ***Sub Research Question 2:*** How can we evaluate an AR solution for the Smart Home environment targeted on elderly people or mild cognitive impairment patients?

***Hypothesis:*** The proposed prototype will provide flexibility to caregivers and assist elderly people or mild cognitive impairment patients on their day-to-day activities. It will increase the efficiency of caregiver's work, improve the patient's quality of life allowing them to act independently with ease.

# 5 Research Theories and Methods

## 5.1 Worldview

Worldviews, design, and research methods form a strategy that need to be taken into consideration to be structured to answer the above-stated research questions. It is essential to investigate a topic from various angles of views.

Phenomenological research is a research approach used to refer to the examination of philosophy and psychology. This involves the lived personal experience of individuals as described by participants. The essence of the participants' experiences who have all experienced similar situations (Giorgi, 2009; Moustakas, 1994), carrying their loved one, was mapped out conducting participatory design sessions, while a survey that quickly collected qualitative data was used as well.

In order to avoid biases, a scientific perspective by an expert Neurologist adds more variables under investigation. Furthermore, the comparison will show more in-depth dimensions about the chosen topic of interest that is examined. In order to collect accurate and relevant data, ideally 3 data gathering activities will be conducted: questionnaires, interviews and focus groups.

In regards to the methodological part, the fundamental principles of anthropocentric design are being followed. The user experience is being considered as a cornerstone in the design of the AR prototype. The Design Thinking process was at the epicenter of this case study, as a methodology that provides a solution-based approach to solving complex problems. It is a significant process that needs to be conducted in order to gain a deeper understanding of the user's needs. While it is not a linear process, it follows a spiral approach which is - contrary to the Waterfall model - more efficient and effective (Dam & Siang, 2020).

## 5.2 Qualitative data gathering

The instruments used in this study are being developed in alignment with the assessment criteria and requirements of Cyprus University of Technology and Tallinn University.

The items on the instrument aligned with the dissertation templates and guidebooks provided, involving a questionnaire, semi-structured interviews or focus groups such as a participatory

design session with the targeted audience. Those instruments address the attitudes of the stakeholders towards an AR application enriching patients quality of life.

It is essential to investigate a topic from many angles of views, thus sessions involving caregivers, families but also experts in the research add more variables under investigation. Further, the comparison between them show more in-depth dimensions about the topic of interest that is examined.

### 5.2.1 Survey with caregivers, experienced therapists and the families of MCI patients

Qualitative research generates “textual data” that focuses on individual cases on a personal level (Farnsworth, 2019). This is an objective technique that was valuable to conduct in order to form a spherical opinion towards the topic of interest.

Through a qualitative approach, a questionnaire - as the primary measurement instrument - was conducted in order to collect the family's possessions and experiences of taking care of their loved one. The research subjects were required to answer open-ended questions providing their honest views on the topic. Thus the survey has been developed in such a manner to give the participants the flexibility to express their opinions freely.

The goal of the overall research survey was to capture their challenges they face, in order to subjectively understand the targeted audience.

**Sample**

Valuable data have been extracted focusing on the subjective experiences of research participants mapping their attitudes towards their insights of providing assistance to their loved ones. This approach formed a better idea on what the patient’s needs and requirements are.

A total of ten (10) participants above the age of 18 completed this questionnaire. Individuals recruited via social media platforms. Subjects were drawn using purposive or judgmental sampling, since research participants were selected considering their engagement in caregiver support communities.

In these circumstances, the researcher approached health organisations that provide support for caregivers and families, and being able to distribute the questionnaire to people that represent the required population.

The survey has been produced in two languages, Greek and English. The Greek version was taken by 9 participants, while only one participant agreed to participate in the English study. The majority of subjects were female.

In terms of the age groups, 4 people stated that they were between the ages of 55-64, followed by 5 participants from the age group between 45 and 54. Only one of the participants stated that they were between 18 and 24 years old. No subjects between the ages of 25 - 54 or older than 65 participated in the study.

**Procedure**

The questionnaire consisted of a series of 11 questions. Demographic information, such as gender and age group was required at the beginning.

Questions gathered data about how long they have been a caregiver for their loved one, how do they help them and what kind of assistance they are providing. They were also asked to elaborate on which ways they provide comfort to their loved one.

Three questions were used to map the patient's ability to independently complete activities of daily living, how the caregivers encourage them to do certain activities on their own, and what kind of activities. Furthermore, a question referring to participation in local groups and activities that the patients enjoy was included as well.

A question regarding the patient’s frustrations in terms of their symptoms was measured on a 5 point likert scale. Finally, the last question allowed the participants to add any other information they feel would be beneficial for the study.

All the questions, except the likert scale, were open ended and optional, to allow the participants to express themselves freely and as honestly as possible.

**Outcomes**

Participants expressed their own views based on their personal experiences of being a caregiver for their relatives. They described situations they come across, such as providing assistance regarding personal hygiene, ensuring the acquisition of essential items and supplies, feeding, medical care, emotional support and entertainment.

The participants stated that they provide comfort to their loved ones by talking to them, trying to maintain active conversations, or establish an efficient way of communication. They ensure

to show their love in various ways. Moreover, they try to keep the patient active by playing cards or using vinyl rugs with games for entertainment.

In terms of the patient's ability to independently complete activities of daily living, the majority of responses were negative, stating that their level of capabilities is low. However, the caregivers provided a set of activities they encourage their loved ones to complete on their own. These include self feed, assistance with basic household activities, such as rinsing lettuce or preparing materials for cooking. Furthermore, personal hygiene tasks are encouraged as well, for instance using the restroom, having a shower or bath, putting on their clothes and show by themselves. Only two participants stated that they don't encourage them to do such activities by themselves.

On the subject of community based activities or hobbies, caregivers are promoting such events by going along with the patients and rewarding their participation. Participants urge the patients to participate by telling them that they will spend time with their friends, and also stated that they are trying to keep them doing their favorite hobbies they had in the past.

In conclusion, although four participants supported that technology has none to little effect on assisted living, a great amount of participants expressed their positive feelings towards the involvement of technology in assisting their loved ones. In response to that, they mentioned the positive influence of television as a medium, which provides audiovisual content assuring them they are not alone. A participant mentioned that they pre recorded stories on their tablet, for their loved one to hear, while they are home by themselves. In this way, the patient would feel their relative's presence. Video calling was also mentioned as having a positive impact on their psychological state, while a potential functionality such as providing the patients support and details on how to do things was also suggested.

### 5.2.2 Generative sessions (one-on-one Interviews) with expert

Semi-structured interview session with an expert Neurologist was carried out, despite the limitations due to the current COVID-19 situation. The Clinical Neurologist holds a Doctor of Philosophy in Dementia - Radiology, while providing healthcare services in a neurological private office in Athens. The interviewee was recruited via an online health service platform. The 40 minute interview was conducted through a video conference. The goal of the overall research interview was to capture their own epistemological views towards the patients attitudes and the overall scope of the present paper.

**Data Analysis**

After conducting the interview, a written review was recorded. Since the interview session was completed in Greek, an English version is provided in the Appendix (APPENDIX IV).

The transcript from the entire interview generated valuable data, as the researcher took notes, mapping the preliminary ideas that emerge from it, while the expert provided useful insights regarding the field.

Initially the expert explained the condition from scientific perspectives, extending on the symptoms a person with dementia might be experiencing. The main topics were covered during this insightful session, have a lot to do with the experiences the patients may have but also the impact on their caregivers. Losing the sense of independence but also the trust for themselves are fundamental subjects offering frustration and disappointment to the patients.

Moreover, they are reported to not be able to recall a certain event, having trouble managing their finances, or forgetting how to complete simple activities. They may have difficulties during communication, as they forget certain worlds, or repeat themselves several times. They also may be emotionally unstable, especially in current times where many cases have reported negative circumstances due to isolation. Depression is a common symptom, especially in the beginning where patients - and their family - cannot accept their diagnosis.

The key topics were also discussed include the patient's capacity to perceive the world around them. They are experiencing a different reality, as dementia influences the patients sensory organs. Visual spatial issues are recorded as well including symptoms such as being unable to perceive the depth and space between objects.

In regards to the care they need to be recipients of, caregivers need to consider using simple words in their communication, while giving them cues might help them as well. Besides that, the Neurologist suggested that games for improving memory would be beneficial in order to exercise the patient's mind and keep them active. Practising short-term memory can improve an individuals' long-term memory too.

To tackle the main research question, which related to in which ways technology and more specifically AR can assist people with MCI in their everyday life activities, the expert expressed their positive attitude towards technology. In their opinion, given that there would not be developed a medication in the near future, we must be open to new solutions.

In conclusion, the Neurologist seemed very ambitious towards the benefits of technology systems, evident by the fact that she was confident that such solutions would have powerful effects on the patients life.

**Protection of Human Rights**

Neurologist was initially informed that their participation in the study was completely voluntary, and there were no direct benefits or risks during the interview. Interviewee was also asked to agree to an audio-taping of the interview, for research purposes. The Consent Form can be found in the Appendix (APPENDIX I)

### 5.2.3 Participatory design approach

Despite the ongoing global pandemic, a participatory workshop is being organised, as it is very beneficial to involve the stakeholders in all stages of the research to ensure that the final outcome will serve their needs and expectations.

However, the ongoing pandemic did not allow dedicated sessions directly with the target population, but instead with caregivers and relatives of people identified with memory loss conditions.

Since the study examines a sensitive topic, the vulnerable group needs to be handled with particular care. The participants were not required to disclose the specific type of disability that their relative's identified with.

Ethics in research involves Human Rights and were taken into high consideration. This particular study will not expose people to more investigations than are necessary to fulfil the research aims. Respecting human rights, including the right to privacy and autonomy is a priority. The Consent Form can be found in the Appendix (APPENDIX VIII).

Out of the five total participants recruited, three were female and two were male. The sessions were moderated, so the researcher had the responsibility to assure that everyone spoke out their thoughts. Debates and continued discussions were expected to happen in the workshop, especially in the brainstorming session. However, these focus group sessions may be intimidating for some people, especially for shy participants.

The silent participants were then approached by the researcher individually by asking them their opinions. Their nonverbal activities and behaviour were observed as well to help the researcher understand their attitudes towards the topic.

Brainstorming - as part of the ideation phase of the Design Thinking process - took an extensive amount of time, as a method to generate ideas to solve design problems. The goal was to produce a vast array of ideas and draw links between them to find potential solutions. One fundamental principle of an effective brainstorming session is to ensure that the atmosphere is judgment-free. The members should be able to express them-selves freely and produce out-of-the-box ideas. Another vital part of a successful process is that every participant has a clear definition of what is expected from them. Ensuring that everyone is on the same page and has a specific issue to solve, can lead to a variety of relevant solutions (Interaction Design Foundation, n.d.).

**Figure 1:** Participatory design workshop

Subjects representing the targeted population provided valuable feedback through discussion and brainstorming on the topic. The data extracted from this generative session were beneficial for the later on development of three main personas.

# 6 Research Methodology

## 6.1 Design Research

Action research was implemented, involving a spiral model of reflective cycles. The primary goal is to generate value for the end user. Empathy towards the end user is the key, as gathering human experiences and artifacts impact the final decisions.

This research work is described as a creative and methodical study that will extend the stock of knowledge in both the healthcare field and Augmented Reality HCI community. Following

this approach, information and data is being collected and analysed to expand the community's understanding of the previously mentioned topic. Research is a framework of thinking that consists of observations, explorations, and conclusions while the purpose, relevance and validity of the research work is being questioned and continuously being explored, investigating the possibilities and ways for further improvements (Manual, 2015). An ongoing cycle that constantly develops, will encourage various aspects of this research to be further observed, questioned, examined, tested and understood (Kumar, 2019).

The process is split into major phases and stages that consist of determination of the purpose of the study, review of related literature, formulation of a research hypothesis, data collection and analysis, communication of findings (Brink, Van der Walt, Van Rensburg, 2006), and finally the design, development and evaluation of the expected outcome.

In regards to the data collection, a mixed methods approach has been implemented, in order to formulate and conceptualise the final outcome. The stakeholders (, families of eldery people and MCI patients, caregivers) are intensively involved in every stage of this research work.

Direct contact with the targeted audience (amnestic mild cognitive impairment patients, cognitively normal elderly subjects) was not possible to be made, as the limitations of the current COVID-19 circumstances influenced the face to face sessions.

The data and qualitative information collected from this process is presented as visuals, stories, drawings, photos and narratives, in order to frame the user's needs and patterns.

## 6.2 Personas

Design research is critical and allows the researcher to understand complex human behaviour and turn that into tangible insights to develop the design. This approach is aiming to answer questions such as: Who are our users?What they need?, What problems are they facing?, How is this product going to assist them?

The previously mentioned data gathered from the research methods were utilised in order to develop three significant User Personas (Figure 2). The participatory design workshop was especially beneficial during this step.

The User Personas include name, age, location and occupation. The three proposed personas answer questions such as their background, their main goal and frustrations. It also provides a possible scenario they may go through.

The demographic information and background sum up the persona's identity. Their main goals allow us to understand their different purposes and lead us to possible solutions or features that are beneficial to consider. Their frustrations answer a question regarding the possible barriers they may encounter in order to complete an activity.

The primary objective of this stage was to develop data driven accurate personas that represent the targeted audience of this research. This stage is important for an in-depth investigation into the patient's needs and requirements.

### 6.2.1 Persona 1

Name: Cathy | Age: 74 | Location: Manchester, UK | Occupation: Housewife

**Background**

Cathy is a former housewife who lost her husband 5 years ago. She was diagnosed with dementia 2 years ago, at the age of 71. Prior to that she had an active life, protesting for several social movements with her husband. Cathy is able to afford private healthcare services, and she currently lives at a nursing home.

She has two children, Selena and Peter. Selena works in a big corporation, while Peter lives and works abroad. Selena visits Cathy at the nursing home once a week, since she works and has her own family. Cathy enjoys her time in the nursing home, as she experiences confort, security and a sense of community.

| | |
|---|---|
| **Goals** | - Be valued from her family members<br>- She wants to find a solution that assist her in her everyday activities |
| **Frustrations** | - To remember how to do certain tasks<br>- She experiences constant mood swings<br>- Although she enjoys using technology, it seems complicated to her |

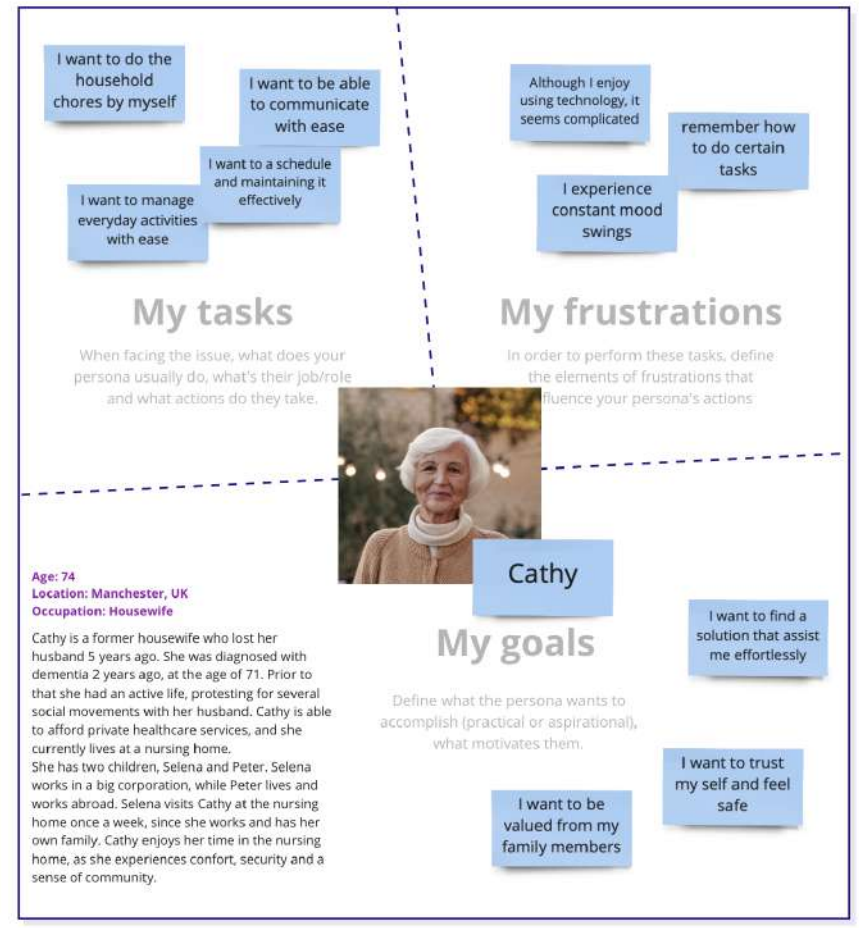


**Figure 2:** User Persona Profile

### 6.2.2 Persona 2

Name: George | Age: 81 | Location: Limassol, Cyprus | Occupation: Retired officer

**Background**

George is an introverted retired officer who was diagnosed with a memory loss condition a year ago. His wife, Angela, is taking care of him assisting him with personal hygiene tasks. He had a very active social life, and was involved in many community based events. He did enjoy fishing as a hobby, as the images of vast horizons provided him with calm feelings and serenity. George also enjoyed repairing and building things on his own in the past, but currently he is not entitled to complete such a task, as it would be dangerous for him and his wife. He and Angela have three children, who rarely come to visit them. Their children are considering buying them a tablet device, as a form of entertainment but communication as well.

| | |
|---|---|
| **Goals** | - He wants stay independent as long as possible<br>- He wants to trust himself and feel safe |
| **Frustrations** | - He wants to be validated by his family<br>- He needs understanding and empathy to feel safe and accepted |

### 6.2.3 Persona 3

Name: Emily | Age: 48 | Location: Athens, Greece | Occupation:

**Background**

Emily was diagnosed with mild cognitive impairment a few months ago. Not being able to remember certain things result in feeling frustrated and angry. She is married to a 52 year old bus driver and has three children. Emily's young onset dementia diagnosis caused unrest among the family members. This already had tremendous implications for the family, as Emily was responsible for managing their finances and the children's needs.The diagnosis was unexpected, and the family is not yet able to understand what Emily is going through.

| | |
|---|---|
| **Goals** | - Trust herself and feel safe<br>- Being able to please her children's needs |
| **Frustrations** | - She needs to write things down to remember<br>- Her recent diagnosis took a heavy toll on her psycho emotional state<br>- She is experiencing certain depression symptoms due to the lack of her family's understanding |

## 6.3 Concept development

### 6.3.1 Main functionality

Based upon the qualitative data generated from the survey, interview and participatory design workshop a proposal concept of a wearable device is being proposed and developed.

The proposal concerns AR smart glasses which are wearable computer-capable glasses (Figure 3) that enhance the user's physical environment by presenting them visual cues and supportive information.

**Figure 3:** Smart Glasses Concept

The main concept would be a solution that provides comfort, support and encouragement to people with dementia. The proposed scenarios motivate the sense of independence and allow the patients to trust themselves during the completion of an activity. The Video prototypes are displaying a potential interaction between the user and their environment. Risk provision and possible dangerous situations were taken into consideration, while a potential implementation with smart home appliances are also being discussed.

This AR solution does not only offer visual cues, but also audible feedback. Taking in account the findings emerged from the qualitative research, patients with dementia would prefer audio guidance. This is an addition that would greatly improve the system's accessibility, forming a powerful new solution for the user's needs.

## 6.4 Initial Sketches

Paper sketching is a crucial aspect of User Experience Design. Is a very efficient way of communicating a solution or a design while allowing the possibility to try out a multitude of ideas and iterate them before settling on one. There are two phases of the sketching process: the idea generation and the refinement. In the initial step - the idea generation - multiple sketches were generated, but since they cannot be fully shaped, it is not uncommon for some of the elements to be incomplete or missing. Various approaches have been considered, but the most appropriate were selected. The context as well as the various constraints of the project were taken into consideration. The second phase included the details and the refinement (Vyhouski, n.d.).

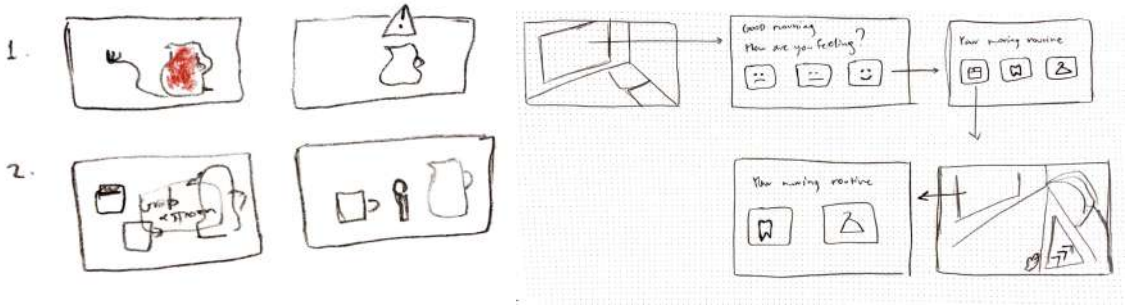


**Figure 4:** Set of sketches

## 6.5 Low fidelity wireframes

Several concepts were developed. The prototypes were produced as video clips and images demonstrating AR visual cues. Several scenarios utilise the capabilities of animation for an indication, to help users to notice information that may be relevant for them. The animations were supposed to not be distractive, but informative providing guidance and support to the user.

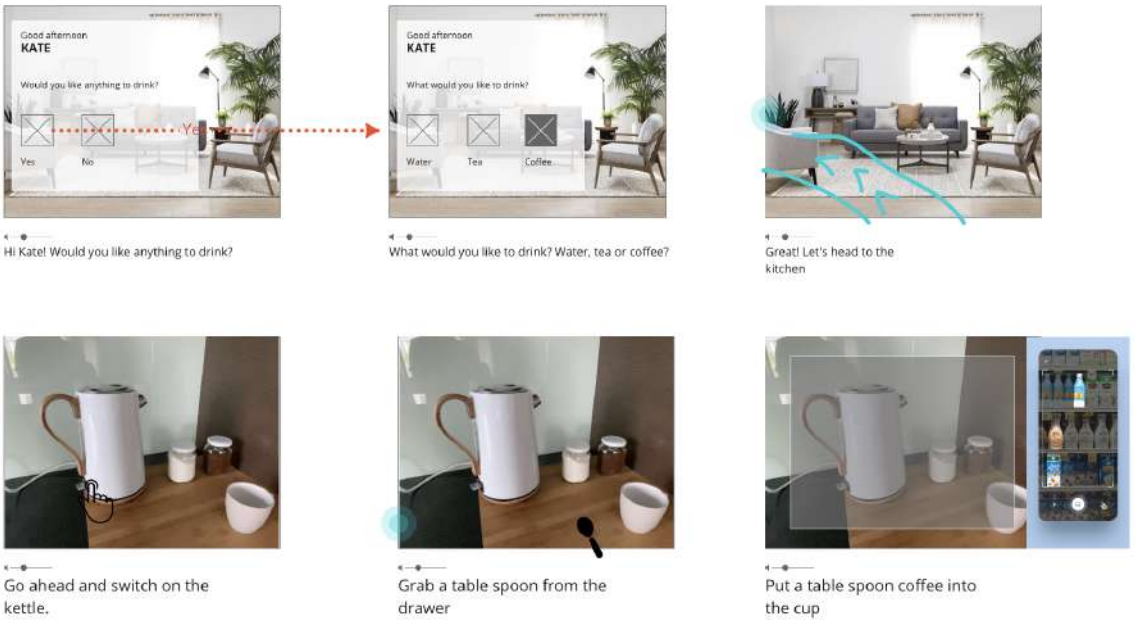


**Figure 5:** User journeys

The main intention of the concepts was to seamlessly communicate important information about the physical environment, providing suggestions for appropriate use. The concepts were developed with creative tools such as Adobe After Effects and Adobe illustrator.


**Figure 6:** Set of concepts

### 6.5.1 Evaluation

A survey was conducted in order to collect the views and general understanding of people towards video content and visual assistance. A total of 15 participants were recruited through social media and they were required to not be diagnosed with a memory loss condition, neither to be visually impaired individuals.

In the beginning of the survey, subjects were asked to state their levels of knowledge on five concepts. These include: Augmented Reality (AR), Virtual Reality (VR), Information Technology (IT), Mild Cognitive Impairment, and Dementia. This knowledge mapping provided useful insights on the background of each participant.

The participants were invited to watch ten scenarios in the form of videos or images and would be required to respond to the same two open-ended questions for each scenario, without thinking too much. In such a way the researcher aspired to examine the participants' understanding of visual cues and what thoughts emerged from them. The two questions are as follows: a) what was the video/image trying to communicate?, and b) what made you think that?


**Figure 7:** AR Visual Cues

The visual cues consisted of indications that guided the user towards an action. Red color to indicate danger, symbols, text, flashing figures located in front of the user, or dashed lines around the physical objects have been evaluated in terms of their capability to be communicated effectively.

The sensory inputs were preserved within the real world when user's pointed their smart glasses camera to a specific location based on their proximity. The system provides multiple ways to inform, guide, alert and engage users.

### 6.5.2 Conclusions

Based on the findings generated from the evaluation of AR visual cue, it is evident that there are certain prompts or indicators which better communicate the desirable message. The findings lead to the conclusion that several scenarios successfully convey the intended information, while others may be oriented in the wrong way or were misplaced in the 3D environment.

More specifically, the first video (Figure 8) displays a gesture icon smoothly moving up and down, guiding the user on how to switch on the boiler. This instruction was clearly communicated to the research subjects as the majority of participants (11), has stated that the video clearly communicates the researcher's intention. Closer attention to the responses coming from the ages that are closest to the targeted audience have been examined further, as participant's comments in the age group of 45 - 54 suggested that the size of the icon could be bigger to be more prominent.

**Figure 8:** AR Visual Cues

The warning sign (Figure 9) presented in the second video was not understandable by many. While the majority guessed right that the kettle would be dangerous as it contains hot water, a great number of participants were under the impression that there was an issue with the device and does not work.

**Figure 9:** AR Visual Cues

Design patterns emerging around user interactions, can be utilised in a mixed environment. However the use of text, may be appropriate for on screen layouts, but findings emerged from the survey lead to the understanding that may not be suited for 3D spaces. Thus the figure of the spoon would be a better choice rather than the text “spoon”.

Whereas showing animations and 3D holograms is great for in-scene experiences such as showing someone how to fix a machine by overlaying 3D content.

## 6.6 High fidelity wireframes

The following use cases are imaginative and propose a potential use of Augmented Reality technologies in the future. The prototypes promote spatial interactions, as they encourage users to move and look around.

In certain proposed scenarios, the UI elements are locked to the screen space and don’t relate to the real world following traditional platforms and applications’ interfaces. These AR examples are being experienced as interfaces that do not depend on the user’s location, but stick on the screen space autonomously. Given that there might be dangerous blocking the user’s vision, the UI elements are being placed in such a way that gives clarity to the user.

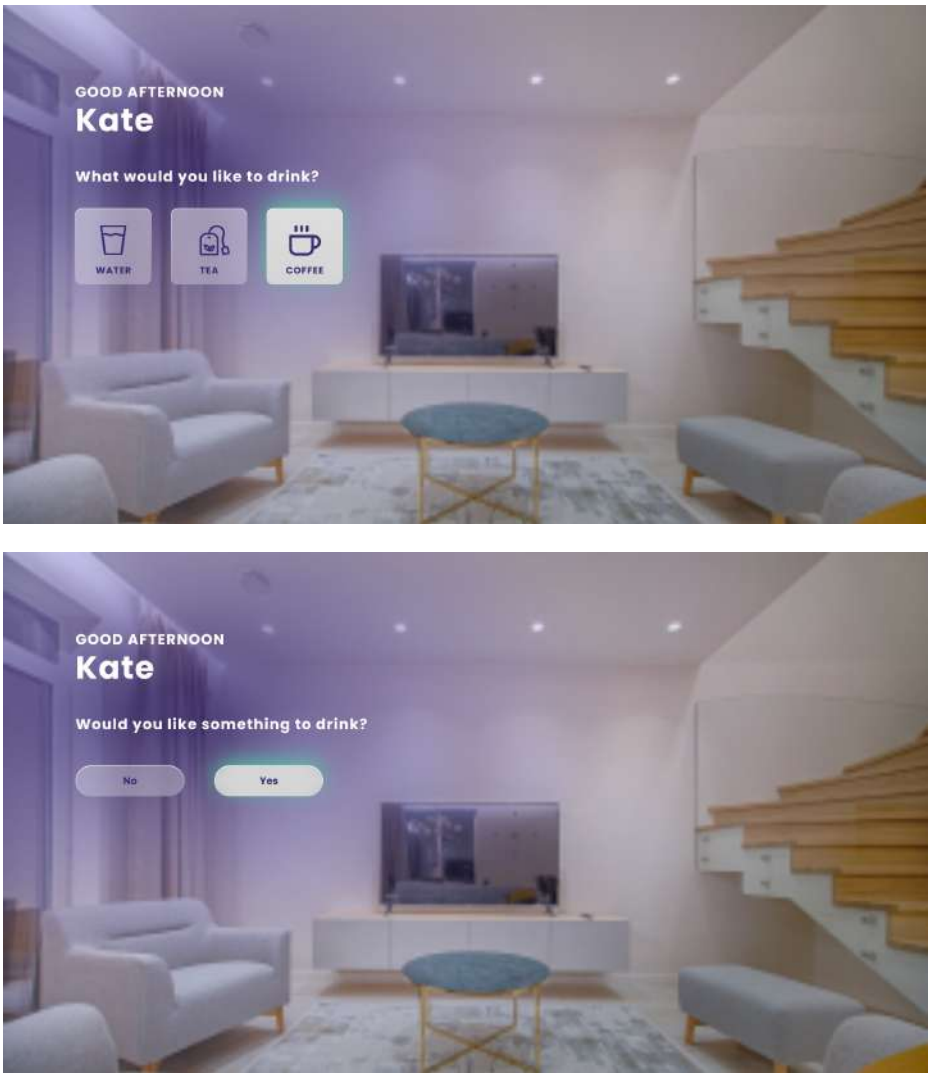


**Figure 10:** High fidelity prototypes

The other prototypes are using the UI attached to a particular object, such as walls or trigger in real world space. This UI integration are either real world objects that have interaction tethered to them or digital objects that are triggered by voice commands.

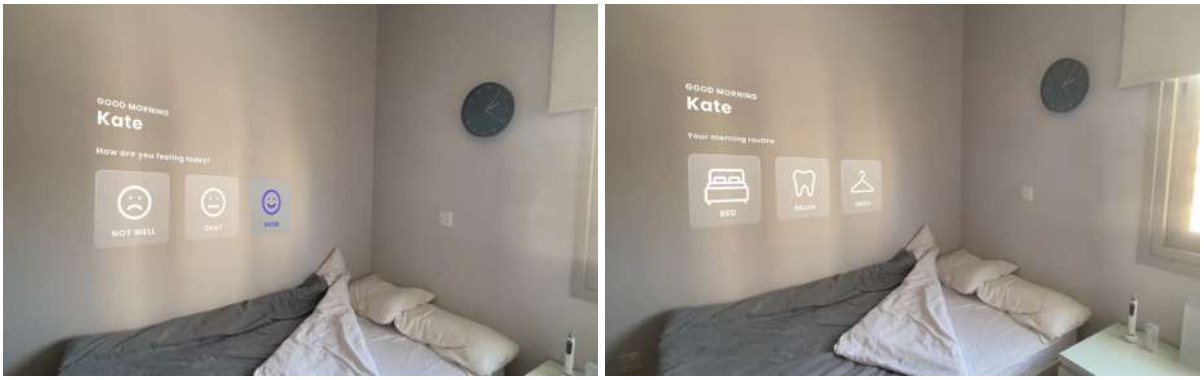


**Figure 11:** High fidelity prototypes

# 7 Results/ Findings

The cognitive changes caused in MCI are noticeable by the individuals experiencing them and by others, but the changes are not severe enough to interfere with daily life or with independent activities. An Augmented Reality framework which aimed to provide emerging forms of interaction within domestic spaces was proposed as a possible solution to improve care and the quality of life of those people.

In the initial stages of this research, qualitative data gathering took place by the establishment of a survey to collect more information on the subject of AR, dementia and caring. Interviews were also held with experts specialising in dementia to get their insight and theories in the subject. A workshop was also conducted in later stages to understand how elderly individuals interact with the environment around them. Unfortunately it was not possible to get individuals with dementia to participate in the workshop due to the complications around COVID19. The workshop however was a success, gathering great findings and insights around the challenges and limitations of the patients in their everyday life.

A framework that embraces the IoT technologies offering an ultimate comfort experience to elder people or people with mild cognitive impairments (MCI). This solution, leveraging a mixed reality environment will allow the user to interact with ease with their surroundings and assists them with daily living activities.

Furthermore, the proposed solution took into consideration the audience's vulnerability, and provided additional protection from accidental injury and support to individuals with MCI while executing daily activities. In regards to the functionality, Gesture Control Technologies as well as Voice Control interactions and embedded automated systems, as such interactions are preferred by the targeted audience.

# CONCLUSIONS

The outcome of this Master's Dissertation are mixed reality scenarios that aimed to provide emerging forms of interaction with concepts in domestic spaces to improve care and the quality of life of elders and MCI patients. The development and evaluation of this AR proof of concept is expected to provide input for future systems not only focused on the medical industry, as it might produce valuable insights on solutions supported by augmented reality in a wider aspect of HCI platforms.

Several scenarios have been investigated, as the Problem Statement was slightly adjusted accordingly influenced by the data collection. The scenarios aimed to provide comfort and ease for the patients to seamlessly complete their everyday life activities. This has been achieved by providing visual hints and clues to help the users with mild cognitive impairments to find the objects they need easily.

Furthermore, regulating domestic devices for instance turning on/off light through the Augmented Reality framework, would be a possibility for further expansion. The on-going evolution of the immersive and semi-immersive technology, allows researchers to constantly evaluate new, reframed hypotheses and investigate the interaction between patients and systems. The use of advanced assistive technology should be encouraged, as the medical community would be advanced by those revolutionary inventions. Extensive research and testing should be taken by both healthy people and diagnosed patients, while neuropsychological testing will play a significant role in the improvement of the fast-moving applications.

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## APPENDIX I - Interview Consent Form

You are invited to participate in a research study exploring how new technology could be used to support people living with dementia at home. You were selected as a possible participant in this research because of your extensive experience in the anatomy, functions, and organic disorders of nerves and the nervous system.

This research is being carried out by Iisa Amalia Michael, an MSc student in the programme in Interaction Design at the Cyprus University of Technology and Tallinn University. Please read this form and ask questions before you decide whether to participate in the study.

**1. What is the purpose of the project?**
Augmented reality (AR) is a technology that allows digital content to be seen on top of the real world. Iisa's research project explores how augmented reality could be used to help people living with dementia to complete everyday tasks independently at home. The results of these sessions will influence future work exploring how best to design an augmented reality system for people living with dementia.

**2. Procedures**
If you decide to participate, you will be asked to answer approximately 10 questions related to your expertise in regards to memory loss conditions in a 30-minute to one-hour interview, agree to an audio-taping of the interview that will be used for this research only, agree to allow the information to be presented to the public in a non-identifying way, and agree to allow other researchers to review the data and transcript of the interview for a reliability check.

**3. Do I have to take part?**
No, it is entirely up to you to decide if you would like to take part. If you wish to take part, you will be required to provide consent at the bottom of this page. However, if at any time you decide you no longer wish to take part in this interview session you are free to withdraw, without giving a reason.

**4. What are the possible disadvantages and risks of taking part?**
The study involves your active participation in providing valuable information in regards to people with dementia. I value your opinions and hope that you will find the session interesting. However, there is a chance that some interviewees will find a question difficult to answer, and I understand in this case if you choose not to respond to a question. There are no other risks anticipated in taking part in this study.

**5. Will my participation involve any discomfort or embarrassment?**
No, your participation is entirely anonymous and we do not expect you to feel any discomfort or embarrassment if you take part in this project.

**6. Who will have access to the information that I provide?**
Your responses will be stored online, and these responses will only be accessible by the researchers involved with this project.

**10. What happens if there is a problem?**
If you have a concern about any aspect of the project you should speak to the researcher [Iisa Amalia Michael] who will do their best to answer any questions.
Please confirm that you meet the following inclusion criteria:

- ❏ I confirm that I am at least 18 years old
- ❏ I confirm that I do not have a diagnosis of dementia

**Statement of Consent**
In order to take part in this survey, you must tick all of the boxes below to show your consent to participate. Please read each of the following statements and tick the boxes if you agree.

- ❏ I have been provided with information explaining what participation in this survey involves.
- ❏ I know who to contact if I want to ask questions and discuss this survey.
- ❏ I have received satisfactory answers to any questions I have.
- ❏ I have received enough information about the survey to make a decision about my participation.
- ❏ I understand that I am free to stop participating in the survey without having to give a reason for withdrawing by closing the browser at any time before I submit my responses.
- ❏ I understand that I am free to withdraw my data during the session.
- ❏ I understand the nature and purpose of the procedures involved in this study. These have been communicated to me on the information above.
- ❏ I understand the data I provide will be treated as confidential, and that on completion of the project my name or other identifying information will not be disclosed in any presentation or publication of the research.
- ❏ I hereby fully and freely consent to my participation in this survey.

Please print your name

_____

Please sign your name

_____

Date

_____

## APPENDIX II - Interview questions

**Introductory questions:**

What are the main symptoms of dementia or MCI?

In which ways do memory loss disorders affect an individual?

Are patients aware that they have dementia?

**Patient's needs and frustrations oriented questions:**

What is it that makes patients feel most sad or frustrated?

What kind of basic needs are patients not able or may omit to do by themselves?

What are the main dangers for the patients living with dementia?

**Provision of support related questions:**

In which ways can we provide comfort or relief to those patients?

How can we provide the feeling of independence?

How can we improve their quality of life?

What types of difficulties do the families or caregivers of a person with dementia face?

In your opinion, do you think technology can assist people living with dementia? If yes, in which ways?

Do you think that the use of technology or a system could replace the presence of the caregiver in the future?

Which elements of the patient - caregiver relationship could not replace?

# APPENDIX III - Interview transcript (Original Language)

**Interviewer:** Καταρχήν να σας ευχαριστήσω για το χρόνο σας και την πολύτιμη βοήθειά σας. Να σας πω δυο λόγια για το research. Προσπαθώ να σχεδιάσω ένα solution για άτομα με άνοια για να βελτιώσω την ποιότητα ζωής και τη δική τους και του περίγυρού τους, είτε είναι οι φροντιστές ή τα μέλη της οικογένειάς τους. Οπότε θα είναι ένα futuristic concept, μια συσκευή σαν γυαλιά. Δεν είμαι σίγουρη αν έχετε είστε γνωρίζετε την έννοια της επαυξημένης πραγματικότητας, που στην ουσία είναι ένα layer ψηφιακού κόσμου πάνω στην πραγματικότητα μέσα στην οποία ζούμε, οπότε είναι ένα mixed reality concept.

**Interviewee:** Όποτε θα είναι στο περιβάλλον τους και θα παρεμβαίνει η εικόνα στον περιβάλλοντα χώρο?

**Interviewer:** Ναι στην ουσία θα μπορούν να παρατηρούν το περιβάλλον τους και το σύστημα θα αντιλαμβάνεται για παράδειγμα ένα ποτήρι που έχει νερό και θα προσδίδει μια επιπλέον πληροφορία του τύπου "αυτό είναι ένα ποτήρι με νερό". Ή αν για παράδειγμα το σενάριο του να φτιάξουν ένα καφέ μόνοι τους και βλέπουν ένα βραστήρα, μπορεί το σύστημα να τους ειδοποιεί, ότι αυτό είναι καυτό νερό για να τους προειδοποιεί και να παραμείνουν πιο ασφαλείς.

Απλά εγώ θέλω να επικεντρωθώ περισσότερο στο πως μπορούμε να δημιουργήσουμε ένα περιβάλλον που να προσφέρει ανακούφιση και ίσως παρηγοριά στους ασθενείς. Με βάση το research που έκανα είδα ότι αυτοί οι ασθενείς έχουν την ανάγκη να νιώθουν το αίσθημα της ανεξαρτησίας. Θα ήθελα αρχικά αν μπορείτε να περιγράψετε τι είναι η άνοια και ποια είναι τα βασικά συμπτώματα αυτής της διαταραχής.

**Interviewee:** Η άνοια είναι ένας γενικός όρος που περιλαμβάνει διαταραχή στις νοητικές λειτουργίες, στη μνήμη, στη σκέψη, στο λόγο... Για να πούμε ότι κάποιος έχει άνοια θα πρέπει να έχει έκπτωση στη λειτουργικότητά του. Στα κριτήρια δηλαδή της άνοιας σε γενικές γραμμές

Αν αρχίσει και εκπίπτει στην λειτουργικότητα στην καθημερινή του δραστηριότητα και μπορεί να έχει δυσκολία στις καθημερινές του δραστηριότητες σε μεγάλο βαθμό, θεωρούμε ότι πληροί τα κριτήρια για την άνοια. Και υπάρχουν κάποιες διαβαθμίσεις, δηλαδή ξεκινάει με ήπια χαρακτηριστικά που ο άνθρωπος μπορεί να είναι ακόμα αυτόνομος σχετικά και με τα χρόνια εξελίσσεται και επιδεινώνεται σε σημείο που ο άνθρωπος να είναι ανήμπορος πια να κάνει και τα πιο απλά πράγματα.

Τώρα αυτό που μου περιγράφετε, το ξέρω ότι υπάρχουν όλες αυτές οι μελέτες πρακτικά δεν ξέρω πόσο έχει χρησιμοποιηθεί σε ασθενείς. Γιατί τωρα ασθενείς προχωρημένου σταδίου δεν ξέρω κατά πόσο θα μπορούν ακόμα και να φορέσουν μια τέτοια συσκευή. Πόσο θα μπορούν να το αποδεχτούν και σαν αντικείμενο και πόσο θα μπορούν να αντιληφθούν ερεθίσματα λεκτικά. Δηλαδή θα πρέπει να εξασφαλιστεί οτι θα μπορούν να καταλάβουν τι τους λέει, εκτός αν είναι κάτι ηχητικό και πάλι αυτό θέλει κάποια εκπαίδευση. Και δεν ξέρω πως ένας άνθρωπος με μεγάλη απώλεια να μπορεί να εκπαιδευτεί για αυτό. Θέλει και κάποια εκπαίδευση να καταλάβει το αρνητικό, το θετικό. Έχουν γίνει κάποιες δοκιμές, έχουν χρησιμοποιηθεί σε κάποιους ασθενείς αυτά τα μοντέλα?

**Interviewer:** Ναι, έχουν γίνει κάποιες μελέτες, απλά ίσως να απευθύνονται σε ασθενής με πιο ήπιας μορφής διαταραχή. Θα ήθελα να ξέρω αν υπάρχει ίσως κάποιος τρόπος να βελτιωθεί η κατάστασή τους.

**Interviewee:** Κοιτάξτε τώρα, σε ασθενείς με ήπια μορφή, έχει νόημα διαδραστικά μια πλατφόρμα που θα μπορούν να αλληλεπιδρούν με εκπαιδευτικό σκοπό. Δηλαδή για παράδειγμα σαν ασκήσεις ενδυνάμωσης ή επικοινωνίας, ή να μιλάνε με κάποιο, δηλαδή να υπάρχει μια αλληλεπίδραση με κάποιο περιβάλλον, τωρα θα είναι αυτό κάποιος άνθρωπος, κάποια φωνή, κάτι που να μπορούν να κάνουν και μόνοι τους βέβαια γιατί αυτό προϋποθέτει τη χρήση κάποιου υπολογιστή. Θα πρέπει να είναι κάτι πολύ απλό. Δηλαδή να μην έχει κάνει χρήση πληκτρολογίου, κάποιας αλλος να τους συνδέσει προφανώς σε αυτό έτσι, δεν μπορούν να μπουν μόνοι

τους, φαντάζομαι. Κια να είναι κάτι απ΄το, με τη χρήση αφής, πολύ απλό για να μπορέσουν να κάνουν διάδραση.Εκτος αν είναι πολύ ήπια η κατάσταση και μπορούν να κάνουν κάποιες βασικές λειτουργίες με την πλατφόρμα. Και κυρίως για εκπαιδευτικούς λόγους. Τώρα οι ασθενείς σε πιο προχωρημένα στάδια θέλουν να έχουν το αίσθημα της ασφάλειας, να αισθάνονται ασφαλείς στο χώρο... και της αλληλεπίδρασης. Δηλαδή στην περίοδο της καραντίνας εδώ στην Ελλάδα, που έχουν απομονωθεί πολλοί από συγγενικό περιβάλλον ακόμα και από κάποιες υπευθυνότητες που μπορεί να είχαν, να πάνε να πιουν ένα καφέ ή να πάνε εκκλησία, υπάρχει τεράστια επιδείνωση δηλαδη το έχω δει σε αυτό το χρόνο λόγο της έλλειψης αλληλεπίδρασης και ερεθισμάτων. Οπότε θέλουν αλληλεπίδραση, θέλουν ασφάλεια και θέλουν και ηρεμία, δηλαδη δεν ξέρω κατα πόσο θα μπορούσε να βοηθήσει ίσως αυτό. Κάπως σα μη φαρμακευτική μέθοδος για τα συμπεριφορικά για τη διέγερση και επιθετικότητα, ίσως να ακούνε μουσική, ίσως να βλέπουν ευχάριστες εικόνες, κάτι τέτοιο ίσως να είχε νόημα.

Από την άλλη αυτό ίσως να μπορύσε να τους προκαλέσει και σύγχυση - δεν ξέρω βέβαια ίσως μετά από μερικά χρόνια που όλοι θα είμαστε πιο εξοικειωμένοι με ένα τέτοιο περιβάλλον, δηλαδή τώρα θα είναι δύσκολο. Μπορεί να τους μπερδέψει, το να βλέπουν εικόνες, χρώματα - δεν ξέρω αυτό πρέπει να είναι κάτι πολύ απλό και πολύ κοντά στην πραγματικότητα που έχουν συνηθίσει.

Επίσης αυτό που ξέρω ότι γίνεται είναι τώρα κάποιες μελέτες με smart home και εφαρμογές που μπορεί να προειδοποιήσουν ή να προλάβουν κάποιον να χτυπήσει ή να ακουμπήσει κάτι ζεστό. Κάπως να ειδοποιείται κάποιος, ο γιατρός του, ο συγγενής του. Γιατί και οι ίδιοι μπορεί να μην αντιληφθούν ακριβώς, μπορεί να τρομάζουν απλά και να μην ξέρουν τι θα πρέπει να κάνουν.

Ανάλογα με το στάδιο και με κάποια εξατομίκευση, δεν μπορεί να είναι το ίδιο για όλους, ίσως πρέπει να υπάρχει κάποιο μοντέλο που να τροποποιείται ανάλογα με τον άνθρωπο. Να μπορείς να παρέμβεις, να κάνεις κάποιες μικροδιορθώσεις.

**Interviewer:** Άρα ας πάρουμε το σενάριο που απευθυνόμαστε σε άτομα με ήπια μορφή διαταραχή θα ήθελα να μου πείτε ποια είναι τα συμπτώματα και με ποιο τρόπο επηρεάζει ένα άτομο αυτού του είδους οι διαταραχές.

**Interviewee:** Συνήθως τέτοια διαταραχή τουλάχιστον Αλτσχάιμερ ξεκινάει από τη μνήμη δηλαδή ξεχνάνε που έχουν βάλει τα πράγματά τους αυτό. Τις δουλειές που έχουν να κάνουν, εμ έτσι πολύ πρακτικά τώρα. Μπορεί να έχουν πρόβλημα με τη διαχείριση στα οικονομικά, συναλλαγές απλές, ή να μη θυμούνται τι πρέπει να ψωνίσουν ή και μέσα στο σπίτι, στο μαγείρεμα, μπορεί να ξεχνάνε τα υλικά είναι μπερδεύονται στο τι πρέπει να χρησιμοποιήσουν, εμ μπορεί να μην μπορούν να ανακαλέσουν πρόσφατα γεγονότα, τι έγινε πριν μία εβδομάδα, τι έγινε πριν δέκα μέρες ή κάτι που έπρεπε να κάνουν, ένα ραντεβού και δεν το θυμούνται δηλαδή να θέλουν μία υπενθύμιση, αυτό που λέμε "τα γράφω" αλλά κάποιος να τους υπενθυμίζει. Εμ... Έτσι συνήθως ξεκινάει. Και μπορεί να έχουν και μία δυσκολία στη συνομιλία με την έννοια να μην μπορούν να θυμηθούν λέξεις, να μην βρίσκουν τις σωστές λέξεις, να μην θυμούνται ονόματα, να χάνονται λίγο να σχηματίσουν μία πρόταση και να χάνουν λίγο τον ειρμό ή αν τους πεις κάποια περίπλοκη εντολή να δυσκολευτούν ή αν πρέπει να κάνουν δύο τρία πράγματα ταυτόχρονα να μην μπορούν. Εκεί στην παράλληλη επεξεργασία να δυσκολεύονται λιγάκι. Εμ... Πού είναι έτσι πράγματα που αρχικά μπορεί να παρατηρήσει κάνεις. Εκεί ναι, μπορείς ίσως να μπορείς να βοηθήσεις...

**Interviewer:** Άρα φαντάζομαι προτιμάτε πιο απλές λέξεις, να χρησιμοποιούνται πιο απλές λέξεις.

**Interviewee:** Ναι απλές εντολές γενικά, ναι.

**Interviewer:** Και από ότι φαντάζομαι ίσως τα οπτικά ερεθίσματα να είναι πιο ισχυρά παρά κάποια λέξη. Αν για παράδειγμα πω ότι η λέξη ψαλίδι θα είναι καλύτερο να δείξω το ψαλίδι.

**Interviewee:** Ναι, εντάξει ναι, στην αρχή ναι, θα καταλάβει δεν είναι τόσο βαριά η διαταραχή για να μην μπορεί να καταλάβει τι είναι το ψαλίδι τα πρώτα στάδια. Συνήθως αυτή η γνώση χάνεται προς το τέλος. Μπορεί να μην μπορεί να το κατονομάσει αλλά ξέρει και πώς χρησιμοποιείται οπότε μπορεί να στο πει περιφραστικά ή να στο δείξει. Εντάξει προς το τέλος μπορεί να μην ξέρει καν τι είναι βέβαια, αλλά για τα αρχικά στάδια μπορεί να μην μπορεί να το πει αλλά ξέρει τι είναι. Ή να το μπερδέψει μπορεί αντί να πει ψαλίδι μπορεί να πει κοπίδι ξέρω γω, ή να πει κάτι άλλο - αλλά ξέρει τι είναι. Και μπορεί ας πούμε με ένα ερέθισμα να τον βοηθήσεις, να του πεις στο πρώτο γράμμα και να το ανακαλέσει. Ναι αυτό είναι αλήθεια.

**Interviewer:** Άρα αν ένα άτομο διαγνωστεί με τέτοιου είδους διαταραχή πώς τον επηρεάζει στην ψυχοσύνθεση του?

**Interviewee:** Συνήθως τα πρώτα συμπτώματα ψυχολογικά είναι η κατάθλιψη, εμ και καμιά φορά συνυπάρχει με την άνοια μπορεί να δημιουργείται και από το γεγονός ότι ο ασθενής καταλαβαίνει πως δεν μπορεί να αντεπεξέλθει.

**Interviewer:** Άρα αντιλαμβάνεται ότι έχει άνοια?

**Interviewee:** Ναι μπορεί στην αρχή να το αντιλαμβάνονται ότι κάτι δεν πάει καλά, όχι ακριβώς ότι έχουν άνοια αλλά ότι δεν μπορούν να αντεπεξέλθουν, δηλαδή είναι άνθρωποι που μπορεί ακόμα να είναι αρκετά λειτουργικοί: να έχουν υποχρεώσεις, να έχουν οικογένεια, να πρέπει να κάνουν κάποια πράγματα κάποιες δουλειές και να καταλαβαίνουν ότι δεν μπορούν - και αυτό τους προκαλεί κάποια κατάθλιψη, δηλαδή κάποια ερεθιστικότητα. Δηλαδή αντιδρούν προς το περιβάλλον τους κάπως επιθετικά και έτσι είναι δύσκολο να παραδεχτούν ότι δεν μπορούν να ανταπεξέλθουν. Εμ... Οπότε αυτό τους προκαλεί εκνευρισμό και έτσι μία κακή διάθεση και είναι κάτι που μπορεί να αντιληφθεί το περιβάλλον και καταλαβαίνουν μόνο αυτό: ότι είναι πολύ απότομοι, ότι μιλάνε άσχημα, έχουνε πολλά νεύρα, επιμένουν πολύ, τους λες "μας το είπες αυτό" και λέει "όχι δεν σας το είπα" ή μάλλον "σου το είπαμε αυτό", "μα δεν το θυμάμαι", και εκεί δημιουργούνται εντάσεις στην αρχή, ναι.

**Interviewer:** Και στην αρχή φαντάζομαι αν και ο περίγυρος είναι και αυτοί αντιδραστικοί...

**Interviewee:** Ε ναι στην αρχή, εντάξει πολύ δεν καταλαβαίνουν τους συγγενείς τους ότι υπάρχει πρόβλημα... Νομίζουν ότι μπορεί να είναι λόγω ηλικίας, αργούν να το καταλάβουν και ίσως δεν θέλουν να το παραδεχτούν, δεν είναι εύκολο αυτό να το παραδεχτείς γιατί είναι μία πορεία χωρίς επιστροφή, τελικά. Δυστυχώς. Οπότε στην αρχή κάπως έτσι είναι η εικόνα.

**Interviewer:** Με βάση την εμπειρία σας και όλα αυτά που βλέπετε καθημερινά τι είναι αυτό που οι ασθενείς τους κάνει να νιώθουν οι μεγαλύτεροι ίπποι ή κάποιο εκνευρισμό, αν σας έχουν εκδηλώσει...

**Interviewee:** Ότι δεν μπορούν να κάνουν τα πράγματα που κάνανε πριν και ότι δεν έχουν εμπιστοσύνη στον εαυτό τους. Ότι κάτι δεν κάνουν σωστά ότι κάνουν λάθη σε αυτά που κάνανε, δηλαδή μπορεί ένας άνθρωπος να μαστόρευε, να του άρεσε να κάνει μαστορέματα στο σπίτι και να μην μπορεί, από χόμπι δηλαδή όχι... Δεν τα καταφέρνει... δεν μπορεί να να βάλει το κατσαβίδι και να σκεφτεί πώς να το κολλήσει... και αυτό είναι πολύ δυσάρεστο. Δηλαδή τώρα παράδειγμα... γιατί μου έρχονται και στο μυαλό ασθενείς που έχω δει ας πούμε που καταλαβαίνουν ότι δεν μπορούν και απογοητεύονται πολύ και στεναχωριούνται.

**Interviewer:** Μμμ, κατάλαβα. Άρα γενικά ποιες είναι οι βασικές ανάγκες που παραλείπουν να κάνουν με το πέρασμα του χρόνου με αυτή την ασθένεια και σε ποιο βαθμό επικινδυνότητας?

**Interviewee:** Σε τι βαθμό επικινδυνότητας μπορεί να φτάσουν?

**Interviewer:** Ναι.

**Interviewee:** Σε πολύ προχωρημένα στάδια πάρα πολύ μεγάλο βαθμό επικινδυνότητας μπορεί να χαθούν καταρχήν. Ναι αυτό, τώρα έχουμε κάτι εφαρμογές στο κινητό, και ειναι και αυτό που πρέπει να έχουν το κινητό μαζί... και αυτό είναι ένα θέμα. Εεε, να χαθούν, να ανοίξουν την πόρτα για να φύγουν. Μπορεί μέσα στο σπίτι να πάθουν πολλά ατυχήματα, να γλιστρήσουν, να πέσουν λόγω αστάθειας ή λόγω κακής αντίληψης. Και αυτό είναι πολύ σημαντικό: του χώρου. Όχι ότι δεν βλέπουν αλλά δεν μπορούν να αντιληφθούν τις αποστάσεις, όχι λόγω όρασης λόγω διαταραχής και κακής αντίληψης στο χώρο. Μπορεί να μην μπορούν να προσανατολιστούν σωστά, να μην θυμούνται πού είναι το μπάνιο, που είναι η κουζίνα και να μπερδεύονται στο πού θα πάνε. Μπορεί ένα αντικείμενο δίπλα να μην μπορούν να καταλάβουν την απόσταση ακριβώς και να πέσουν πάνω ας πούμε, ή να παραπατήσουν σε ένα σκαλάκι, να μην το υπολογίσουν σωστά. Μπορεί να χρησιμοποιήσουν αιχμηρά μαχαίρια, ψαλίδια που δεν ξέρουν πώς να τα χρησιμοποιήσουν και να κοπούν. Μέχρι και να καταπιούν απορρυπαντικά, τέτοιου είδους πράγματα, βενζίνες. Σε προχωρημένα στάδια αρκετά, προχωρημένα μεν αλλά ο άνθρωπος λειτουργεί, περπατάει... δεν είναι στο κρεβάτι. Υπάρχουν τέτοιες περιπτώσεις που θέλουνε εξαιρετικά μεγάλη προσοχή. Ή να κάνουν κακό σε κάποιον άλλον. Δηλαδή είχα μία ασθενή που - και νέα γυναίκα - που πήγε να ταΐσει το εγγονάκι της 2 χρόνων με ένα φαγητό που δεν ήτανε... Θα είχε πνιγεί το παιδί. Αλλά αυτή το είχε ταΐσει για καλό, δεν μπορούσε να σκεφτεί ότι... Χωρίς πρόθεση, δεν είναι επιθετικοί με την έννοια να κάνουνε κακό σε κάποιον λόγο πρόθεσης, απλά δεν το αντιλαμβάνονται. Εκεί ναι, αν μπορεί να βρεθεί κάτι που να τους προστατεύει ειδικά όταν είναι μόνοι τους, γιατί εντάξει, φαντάζομαι όλα αυτά γίνονται με το σκεπτικό ότι ο άνθρωπος μπορεί να λειτουργήσει μόνος του, χωρίς να έχει μόνιμο φροντιστή 24 ώρες.

**Interviewer:** Ναι χωρίς να έχει μόνιμα φροντιστή ή ο φροντιστής να...

**Interviewee:** Μπορεί να έρθει η ώρα που να θέλει να φύγει... Εντάξει γιατί να είναι τελείως μόνος του δεν μπορεί... ότι και να κάνεις δεν νομίζω ότι μπορεί για ένα εικοσιτετράωρο να λειτουργήσει αλλά ίσως για κάποια ώρα που πρέπει ο άλλος να φύγει να μην μπορεί να είναι μαζί να μπορεί να έχει μία ασφάλεια στο περιβάλλον.

**Interviewer:** Θα ρωτήσω με ποιους τρόπους θα μπορούσαμε να του παρέχουμε αυτό το αίσθημα της ανεξαρτησίας, ή της άνεσης, ή του να εμπιστεύεται τον εαυτό του?

**Interviewee:** Τώρα σε στάδια που δεν είναι τόσο προχωρημένη η κατάσταση ίσως με κάποιες απλές εντολές αυτό που είπατε... Δηλαδή αν θέλει να φτιάξει ένα καφέ να του λέει κάποιος τι να κάνει, για απλές τώρα όμως λειτουργίες. Με την έννοια της εντολής, της υπενθύμισης. Να υπενθυμίζονται ίσως κάποιες δραστηριότητες ή να υπενθυμίζει ακόμα το τι μέρα είναι σήμερα δηλαδή αυτό που λέω και εγώ στους ασθενείς. Φτιάξτε του ένα ημερολόγιο και πέστε του: "σήμερα είναι Τετάρτη έχουμε να κάνουμε αυτό και αυτό και αυτό και αυτό" εμ "θα έρθει ο ένας...", δηλαδή κάτι σαν υπενθύμιση για να μη χάνουν και την αίσθηση του τι γίνεται γύρω του. Εμμ... Και ίσως κάποιες απλές εντολές που μπορεί να κάνει στο σπίτι, δηλαδή να φτιάξει ένα καφέ, να βάλει το φαγητό του, κάποια έτσι καθημερινά - που για μας είναι απλά - αλλά για εκείνους θέλουν κάποια καθοδήγηση. Και ίσως κάποια μορφή απασχόλησης για να μην έχουνε και αυτή την αίσθηση ότι δεν μπορούν να κάνουν τίποτα. Γιατί βαριούνται κιόλας, δηλαδή είναι απαθής γιατί δεν έχουν κάτι να κάνουν. Και το περιβάλλον καμιά φορά επειδή... τους απαλλάσσουν από δραστηριότητες, γιατί δεν θέλουν να τους κουράσουν, αλλά τελικά αυτό είναι μπούμερανγκ γιατί δεν κάνουν τίποτα και γίνονται χειρότερα. Δηλαδή μπορούν να πουν μία απλή εντολή δηλαδή βάλε το τραπέζι, βάλε το πιάτο. Κάπως έτσι για να έχει μία δραστηριότητα μέσα στη μέρα, απλά πραγματάκια. Αυτό ναι, έχει θα είχε νόημα, να υπάρχει σαν υπενθύμιση σαν πρόγραμμα δραστηριοτήτων, κάπως έτσι το φαντάζομαι.

**Interviewer:** Από ότι έχω δει καθοδηγήτε και φροντιστές ή άτομα που προσέχουν τα άτομα με άνοια, τι είδους δραστηριότητες τους προτείνετε συνήθως?

**Interviewee:** Σε πολύ ήπια στάδια βοηθούν ασκήσεις ενδυνάμωσης, που είναι κάτι σαν νοητικά παιχνίδια. Εντάξει τα ξέρετε φαντάζομαι αυτά, υπάρχουν πάρα πολλές εφαρμογές και site... Τώρα από κει και πέρα νομίζω ότι οποιαδήποτε δραστηριότητα μπορεί να κάνει ένας άνθρωπος μέσα στην ημέρα, αν είχε κάποιο χόμπι που του

άρεσε, κάτι που έκανε παλιά να το διατηρήσει. Μπορεί να είναι πλέξιμο, μπορεί να είναι γράψιμο, μπορεί να είναι ένα ζωάκι, ο κήπος να ασχοληθούν. Αλλά ακόμα και πιο απλές δραστηριότητες, δηλαδή να στρώσεις το τραπέζι, να ασχοληθεί με την κουζίνα να καθαρίσει να τακτοποιήσει, να κάνει τακτοποίηση σε κάποια πράγματα που ψωνίσαμε - οτιδήποτε κάνει είναι πολύ σημαντικό. Δεν χρειάζεται να είναι κάτι πολύ περίπλοκο, σε προχωρημένη νόσο, έτσι; Κάτι πολύ απλό: να φτιάξει ένα καφέ - που δεν είναι τόσο απλό να φτιάξει ένα καφέ - ή να ζεστάνεις ένα φαγητό. Οτιδήποτε μπορεί να κάνει μέσα στο σπίτι, είναι θετικό, βοηθάει. Αλλά αυτό έχει να κάνει με το σε τι στάδιο είναι ο ασθενής.

**Interviewer:** Είπατε πριν για ασκήσεις ενδυνάμωσης, πώς βλέπετε τη χρήση της τεχνολογίας στο να βοηθά τέτοια άτομα;

**Interviewee:** Εντάξει γενικά, τουλάχιστον σε αυτή τη γενιά τώρα, πού είναι οι άνθρωποι αυτοί που είναι τώρα από 60 μέχρι 80 - κάποιοι είναι εξοικειωμένοι αρκετά και μπορούν, σε αρχόμενα στάδια. Οι πιο πολλοί δεν είναι, δεν τους είναι εύκολο να κάνουν στον υπολογιστή μόνοι τους, θέλουν κάποιον βοηθό. Δηλαδή συνήθως καμιά φορά τα εκτυπώνουν, αν είναι κάποια κείμενα και τους τα δίνουν να τα κάνουν με το χέρι, δεν είναι τόσο εξοικειωμένοι... Εκτός αυτό, αν είναι κάτι που που δεν θέλει χρήση πληκτρολογίου να γράψουν, ίσως κάτι άλλο... Ίσως με ηχητική μορφή. Υπάρχουν και κάποια που τα έχω δει, σαν το Wii που κάνουν κινήσεις... Έχουν βγει διάφορα τώρα, εδώ στην Ελλάδα δεν νομίζω ότι εφαρμόζεται και πάρα πολύ. Υπάρχουν κάποιες, ας πούμε η εταιρεία άνοιας, που έχει κάποιες εφαρμογές στη σελίδα της, αλλά νομίζω πρακτικά είναι δύσκολο δεν είναι εύκολο να τις κάνει κάποιος, τώρα σε αυτή τη γενιά τουλάχιστον. Αλλά ίσως στο μέλλον αυτό θα είναι πιο εύκολο γιατί θα εξοικειωθούν και οι φροντιστές περισσότερο στο να βοηθάνε τους ηλικιωμένους. Δηλαδή στην επόμενη ή μεθεπόμενη γενιά, πιστεύω ότι σίγουρα θα έχει μέλλον αυτό. Έτσι όπως έχει γίνει η κατάσταση και η εξέλιξη της τεχνολογίας, σίγουρα. Θα είναι το επόμενο στάδιο αυτό πιστεύω.

**Interviewer:** Άρα, θεωρείτε πώς η χρήση αυτής της τεχνολογίας ή κάποιου τέτοιου είδους συστήματος θα μπορούσε να αντικαταστήσει τελείως ή εν μέρει την παρουσία του φροντιστή;

**Interviewee:** Το "το τελείως" δεν νομίζω ότι είναι εύκολο, τουλάχιστον με τα δεδομένα του δικού μου κεφάλου. Το "το τελείως" δεν ξέρω αν φτάσουμε ποτέ σε αυτό το σημείο, μπορεί δεν το αποκλείω. Τώρα όμως το βλέπω λίγο δύσκολο. Ίσως λειτουργεί επικουρικά, π.χ. για κάποιες ώρες, για κάποιο διάστημα...

**Interviewer:** Ποια θεωρείτε ότι είναι τα στοιχεία που δεν μπορεί να αντικαταστήσει η τεχνολογία σε σχέση με τον ανθρώπινο παράγοντα;

**Interviewee:** Εμ, να αντικατασταθεί τελείως ο ανθρώπινος παράγοντας σε αυτό το επίπεδο, ο φροντιστής δηλαδή, εννοείτε; Εεε, τώρα κοιτάξτε να σας πω. Δηλαδή άνθρωποι που είναι με άνοια, πολύ προχωρημένο σταδίου, δεν αναγνωρίζουν καν τους συγγενείς τους, ότι είναι ο σύζυγος ή ξέρω γω ο γιος. Δεν τους αναγνωρίζουν, δεν καταλαβαίνουν ποιοι είναι. Και ένα ρομπότ να ήταν ενδεχομένως, που τον τάιζε, τον άλλαζε, τον περιποιούνταν, ή του μιλούσε - καλά όχι ότι είναι ακριβώς το ίδιο - αλλά θέλω να πω ότι κάποιοι δεν αναγνωρίζουν την ιδιότητά του συγγενή, έχουν χάσει τελείως την ανάμνηση. Βέβαια εγώ πάντα πιστεύω ότι κάτι... Δηλαδή υπάρχει ένα συναίσθημα, κάποιες στιγμές υπάρχουν κάποιες αναλαμπές δηλαδή, μπορεί να τον βλέπουν και να μην καταλαβαίνουν ποιος είναι αλλά του χαμογελάνε. Εντάξει αυτό δεν πιστεύω ότι μπορεί να αντικατασταθεί ποτέ δηλαδή, πραγματικά. Αλλά η φροντίδα όμως η καθημερινή και η κάλυψη των βασικών αναγκών σε αυτό το στάδιο θα μπορούσε να γίνει και από ένα ρομπότ, από μία μηχανή, σε τέτοιες περιπτώσεις που δεν υπάρχει... Ή ακόμα και όταν φτάσουμε σε στάδιο να είναι κλινήρης. Δηλαδή αν ο ασθενής είναι τόσο βαριά που να είναι στο κρεβάτι να μην μπορεί να κινηθεί, ή απλά πρέπει κάποιος να τον ταΐσει ή ξέρω γω να τον... Και δεν αναγνωρίζει αν το κάνω εγώ αν το κάνετε εσείς ή αν το κάνει ο γείτονας, ναι εκεί μπορεί. Να γίνει πλήρης αντικατάσταση. Τώρα σε πιο πρώιμες μορφές, ναι σε περίπτωση που δεν υπάρχει κάποιος φροντιστής, φαντάζομαι ότι θα μπορούσε. Τώρα αν θα είναι ισάξιο, δεν μπορώ να το πω - ότι θα είναι ακριβώς το ίδιο. Αλλά σίγουρα θα μπορεί να τον υποκαταστήσει ενδεχομένως, ίσως για κάποιο διάστημα αρκετά μεγάλο.

**Interviewer:** Πάνω σε αυτό που είπατε, ποια ακριβώς στοιχεία θα μπορούσε να υποκαταστήσει. Εννοώ ότι οι βασικές ανάγκες προσφέρει ο φροντιστής που θα μπορούσαν να αντικατασταθούν από μία τέτοιου είδους εφαρμογή;

**Interviewee:** Εντάξει τη φροντίδα, η βοήθεια στη σίτιση, τη βοήθεια στο ντύσιμο, τη βοήθεια στο μπάνιο. Αυτό να του πει "ελα τώρα είναι η ώρα να πάμε να φάμε", "έλα τώρα είναι η ώρα να βάλεις τα ρούχα σου", δηλαδή να του δίνει κάποιες οδηγίες - κάτι σαν πρόγραμμα, σαν να έχεις εγκατεστημένο στο μυαλό σου πρόγραμμα που σου λέει τι πρέπει να κάνεις ή κάπου που κολλάς να σου το θυμίζει και να σε βοηθάει. Και θα μπορούσε να είναι μία μόνιμη παρουσία αυτού του μοντέλου, για συνεχή καθοδήγηση και υπενθύμιση και βασικές ανάγκες αυτού του τύπου. "Έλα τώρα να πάμε στην τουαλέτα", κάπως σε αυτό το επίπεδο θα μπορούσε να βοηθήσει. Εντάξει κι άλλα πράγματα θα μπορούσε να κάνει: να του διαβάζει, να κάνει και πιο... Να του ανοίγει τα φώτα, να του βάζει μουσική… Φαντάζομαι ότι μπορεί να γίνουν όλα αυτά.

**Interviewer:** Ναι αυτά που είπαμε προηγουμένως με το smart home, να διευκολύνει...

**Interviewee:** Να μπαίνει σε ένα δωμάτιο να ανάβει τα φώτα, ή το βράδυ που ξυπνάει να ξέρει πού θα πάει, ή όταν πρέπει να πάει κάπου να ξέρει πού να πάει, να μην μπερδεύεται.

**Interviewer:** Εντάξει γενικά αυτές ήταν οι ερωτήσεις, εμ…

**Interviewee:** Εντάξει εγώ γενικά αν θέλετε οτιδηποτε, αν έχετε κάποια απορία μπορούμε να επικοινωνούμε ή και στο email μου. Θα χαρώ πολύ να σας βοηθήσω, ότι θέλετε! Είναι πολύ ενδιαφέρον όλο αυτό και εντάξει νομίζω ότι έχει πολύ μέλλον - γιατί προς το παρόν φάρμακα δεν υπάρχουν… Ο΄ποτε οτιδήποτε μπορεί να βοηθήσει τους ασθενείς αυτούς είναι σημαντικό και πρέπει να είμαστε ανοιχτοί σε όλες τις μεθόδους. Πρέπει να προχωράμε μπροστά!

**Interviewer:** Ευχαριστώ πάρα πολύ για το χρόνο σας!

**Interviewee:** Έγινε, χάρηκα πολύ. Καλή επιτυχία, και τα ξαναλέμε!

**Interviewer:** Γεια σας, καλή συνέχεια!

# APPENDIX IV - Interview transcript (Translated)

Interviewer: First of all, I would like to thank you for your time and your valuable help. Let me introduce you to the research objectives. I aim to design a solution for people with dementia, that could improve the quality of life, both for themselves and those around them, whether they are caregivers or family members. So it will be a futuristic concept, a device similar to glasses. I'm not sure if you are familiar with the concept of augmented reality, which is essentially a layer of the digital world upon the reality which we live in, so it is a mixed reality concept.

Interviewee: So will they be in their normal environment but with the image interfering with the surrounding area;

Interviewer: Yes, in fact they will be able to observe their environment and the system will perceive for example a glass that has water in it and it will provide additional information such as "this is a glass of water". Or for example in the scenario where they are making coffee themselves and they see a kettle, the system may warn them that this is hot water to keep them safer.

I just want to focus more on how we can create an environment that offers relief and perhaps comfort to patients. Based on my research I saw that these patients need to feel a sense of independence. I would first kindly ask you to describe what dementia is and what the main symptoms of this disorder are.

Interviewee: Dementia is a general term that includes a disorder in mental functions, memory, thinking, speech... To say that someone has dementia, they should have restricted functionality. In the functions that make up the criteria of dementia in general.

If they start having less functionality in their daily activity and may have difficulty in their daily activities to a large extent, we consider that they meet the criteria for dementia. And there are some degrees to it, that is, it starts with some mild inconveniences but the person can still be autonomous and over the years it evolves and deteriorates to the point that the person is no longer able to do even the simplest of things.

Now what you describe to me, I know that there are all these studies but I don’t know how much of it has been practically used in patients. Because I am not sure whether advanced stage patients would even be able to wear such a device. How much they would be willing to accept it as an object and how much they would be able to perceive stimuli verbally. I mean, we have to make sure that they can understand what it is telling them, unless it is something audible but that again requires some training. And I don’t see how a person with a great loss can be trained for this. They also need to practice to discern the negative from the positive. Have there been any tests, have these models been used in any patients?

Interviewer: Yes, some studies have been made but they are mostly aimed at patients with a milder disorder. I would like to know if there is any way to improve their situation.

Interviewee: Look now, for patients with a mild form of dementia, a platform that they can interact with for educational purposes makes sense. That is, for example, for strengthening or communication exercises, or for talking to someone, having an interaction with an environment, whether be it a person, a voice, something that they can do on their own, of course, because this requires the use of a computer. It should be something very simple. It shouldn’t even require the use of a keyboard since someone else would obviously have to connect them to it and they won’t be able to do it on their own, I imagine. And it has to be very simple, like a touch

interface, so that they can interact with it. Unless the situation is very mild and they can perform some basic functions with the platform. And mainly for educational purposes. Now patients in more advanced stages want to have a sense of security, to feel safe in a space... and in interactions. So like, during the quarantine here in Greece, where many have been isolated from relatives and even from some responsibilities they may have had, going out for a coffee or to church, there is a huge deterioration, I have seen it happen during this time because of the lack of interaction and stimuli. So they need interaction, they need security and peace, so I do not know how much that might help. Maybe like a non-pharmacological method for behavioral problems, for arousal and aggression, maybe they could listen to music, see enjoyable images, something like that might have a point.

On the other hand, this could confuse them – I'm not sure, of course, maybe a few years down the road when we're all more familiar with such an environment it could work, now it will be difficult. It can confuse them, seeing images, colors - I don't know, it must be something very simple and very close to the reality they are used to.

Also I know that some studies are being made now with regards to smart home applications that can warn or prevent someone from being hurt or touching something hot. These should somehow notify someone, a doctor or a relative. Because they themselves may not realize exactly what is happening, they may simply get frightened and not know what to do.

Depending on the stage and some personalization, it may not be the same for everyone, maybe there should be a model that can be modified according to the person. It needs to be modifiable so that you can make minor corrections.

Interviewer: So let's take the scenario where we focus on people with a mild form of the disorder, I would like you to tell me what the symptoms are and how a person with this type of disorder is affected.

Interviewee: Usually such a disorder, Alzheimer's at least, starts with memory. They start to forget where they've put their things. The tasks they have to do, I'm speaking very hands on now. They may have trouble managing finances, simple transactions, or they may not remember what to buy or even at home, in cooking, they may forget the ingredients or get confused as to what to use, they may not be able to recall recent events, what happened a week ago, what happened ten days ago or something they had to do, an appointment. They want a reminder, what we call "writing it down" but someone needs to remind them. Um ... that's how it usually starts. And they may have a difficulty in conversation as well, in the sense that they cannot remember words, cannot find the right words, cannot remember names, get lost a little while forming a sentence or lose their train of thought, or maybe if you tell them a complicated command they will have some difficulty or they might not be able to do two or three things at the same time. They have some difficulty in parallel processing. Um... These are things you can notice initially. And yes, maybe you can help there...

Interviewer: So I guess you prefer simpler words, to use simpler words.

Interviewee: Yes simple commands in general, yes.

Interviewer: And from what I can imagine, visual stimuli should be more powerful than verbal. For example rather than saying the word scissors it would be better to show the scissors.

Interviewee: Yes, sure, at first yes, they will understand, the disorder is not so severe that they cannot understand what the scissors are in the early stages. Usually this knowledge is lost towards the end. They may not be able to name it but they know how it is used so they can say what it does or show it to you. Towards the end, they may not even know what it is of course, but for the initial stages they may not be able to name it but they know what it is. Or they may confuse it ånd instead of saying scissors they may say knife or whatever, or they may say something else - but they know what it is. And you can help them with a stimulus, by telling them let's say the first letter so they can recall it. Yes this is true.

Interviewer: So if a person is diagnosed with this type of disorder, how does it affect their mentality?

Interviewee: Usually the first psychological symptoms are depression, which sometimes coexists with dementia and can be caused by the fact that the patient understands that they cannot cope.

Interviewer: So do they realize they have dementia?

Interviewee: Yes, at first they may realize that something is wrong, not that they have dementia per se but that they cannot cope, that is, they are people who can still be quite functional: they have obligations, they have a family, they have to do some things, some tasks and they realize that they cannot do it - and this causes them some depression, some irritability. That is, they react to their environment somewhat aggressively and so it is difficult to admit that they cannot cope. Uhm... so this irritates them and puts them in a bad mood and it is something that their environment can perceive and they only see this: that they are very abrupt, that they speak badly, they are angry, they insist a lot, they tell them "you said that already"and the patient responds "no I haven't" or rather "we told you this", "but I don't remember", and that creates tension in the beginning, yes.

Interviewer: And I can imagine at first if the people around are also reactionary...

Interviewee: Yes, a lot of people don't realize that there is a problem with their relative... They think that it may be due to age, they are slow to understand and maybe they don't want to admit it, it is not easy to admit it because it is a one way trip, in the end. Unfortunately. So that's kind of the picture in the beginning.

Interviewer: Based on your experience and everything you see every day, what is the one thing that makes the patients feel the most anger or irritation, if they have told you...

Interviewee: That they can't do the things they did before and that they don't have confidence in themselves. That they do something wrong, that they make mistakes where they didn't before, for example, a person could be doing housework, he liked to do DIY stuff at home and he cannot do his hobby anymore... He has no success... he can't place the screwdriver and think about how to use it... and that's very unpleasant. That is just an example... because some patients now come to mind who I have seen, let's say that they can't do things and they get very disappointed and sad.

Interviewer: Hmmm, I get it. So in general, what are the basic needs that they fail to do over time with this disease and what is the degree of risk?

Interviewee: How dangerous can they get?

Interviewer: Yes.

Interviewee: At very advanced stages, there is too much risk, they can get lost in the first place. For that there are some mobile applications now, but then they have to carry their phone at all times... and that is an issue. They can get lost, open the door and leave. A lot of accidents can occur in the house, slipping, falling due to instability or poor perception. And this is very important: space. It's not that that they can't see but they cannot perceive

distances, not because of lack of vision but due to disturbance and poor space perception. They may not be able to orient themselves properly, they may not remember where the bathroom is, where the kitchen is and they may be confused about where to go. For example they may not be able to grasp the exact distance of a nearby object and fall over it, or stumble on a step, calculate it wrongly. They could try to use sharp knives, scissors and not know how and cut themselves. They could even swallow detergents, things like that, gasoline. In quite advanced stages, which are advanced yes but the patient can walk... they are not in bed. There are such cases that require extremely great attention. Or they could hurt someone else. That is, I had a patient - a young woman - who tried to feed her 2-year-old grandson with a food that was not ... The child could have choked on it. But she had good intentions, she could not think that... Without intention, they are not dangerous in the sense of intentionally harming someone, they just don't realize it. Then yes, if a solution can be found that protects them especially when they are alone, because okay, I imagine all this is done on the grounds that the patient would act alone, without a 24/7 permanent caregiver.

Interviewer: Yes without a permanent caregiver or if the caregiver will...

Interviewee: There may come a time when they want to leave... Okay because the patients can't be completely by themselves... whatever you do, I don't think it can work 24/7 but maybe for some time when the other person has to leave or can't be with the patient, they can have some safety in the environment.

Interviewer: I would like ask in what ways could we give him this feeling of independence, of comfort, of self-confidence?

Interviewee: Now in stages where the situation is not so advanced, maybe what you said with some simple commands... That is, if they want to make a coffee, someone could tell them what to do, but only for simple tasks. For commands or reminders. It may remind them of some activities or even of what day it is, so the things I myself say to patients. Make them a diary and tell them: "today is Wednesday we have to do this and this and this and this" "someone will come...", something like a reminder so as not to lose the sense of what is happening around them. Emm... And maybe some simple commands they can do at home, that is, make a coffee, put food on the plate, something like that every day - which is simple for us - but for them, they need some guidance. And maybe some form of task giving so that they don't have this feeling that they can't do anything. Since they are already bored, they are apathetic because they have nothing to do. And their environment sometimes... they don't let them do any activities, because they don't want to tire them, but this hurts them more in the end because they do nothing and they get worse. So it could give them a simple command, let's say, put this on the table, take your plate. Anything just to have an activity during the day, little things. Then yes, that would make sense, to exist as a reminder as an activities application, I can see that happening.

Interviewer: From what I have seen, you also guide caregivers or people caring for people with dementia, what kind of activities do you usually suggest to them?

Interviewee: In very mild stages, some strengthening exercises can help, which are like mind games. I guess you've heard of these, there are a lot apps and websites... Beyond that, I think that any activity a person can do during the day, if they had a hobby they liked to do, something they used to do, they should keep it up. That could be knitting, writing, maybe a pet, taking care of the garden. But even simpler activities, like setting the table, cleaning the kitchen, tidying up, putting things in their place - whatever they do is very important. It doesn't have to be very complicated, in a advanced disease, does it? Something very simple: making coffee - which is not so simple to make coffee - or heating up a meal. Anything they can do in the house is positive, it helps. But that has to do with the stage the patient is at.

Interviewer: You talked about strengthening exercises, how do you see technology helping such people?

Interviewee: Okay in general, at least in this generation, for these people who are now from 60 to 80 years old - some are familiar enough and can use technology, in the early stages. Most are not, it is not easy for them to use a computer themselves, they need assistance. They may print any texts and write them by hand, they are not so familiar with digital things... Besides that, there are some things that don't use a keyboard, maybe it's something else ... Maybe in audio form. There are some that I have seen, like the Wii that you can make moves... A lot of things have come out now, but here in Greece they are not very common. There are some, for example the dementia company, which has some applications on its page, but I think in practice they are difficult to do, at least for the current generation. But perhaps in the future this will be easier because caregivers will be more familiar with helping the elderly. So in the next generation, I believe that this will definitely have a future. With the evolution that technology goes through, I believe this will be the next stage, for sure.

Interviewer: So, do you believe that the use of this technology or of a similar kind of system could completely or partially replace the presence of the caregiver?

Interviewee: I don't think "completely" is easy, at least from my point of view. I don't know if we will ever get to this "complete replacement" stage, but maybe I can't rule it out. But for now I find it a little difficult. It may work as an adjunct, e.g. for some hours, for some time...

Interviewer: What do you think are the elements that technology cannot replace in relation to the human factor?

Interviewee: Uhm, you mean to completely replace the human factor, the caregiver? Ehh, what can I say. Look, people with dementia, at a very advanced stage, don't even recognize their relatives, theirs husband or you know their son. They don't recognize them, they don't know who they are. It could very well be a robot that is feeding them, changing them, caring for them, or talking to them - well it's not exactly the same - but I mean some people don't recognize their family, they've completely lost the memory. Of course I always believe that there is something... That is, there is an emotion, sometimes there are some flashes, they may see their family and not know who they are but smile at them. Right, I don't think this can ever be replaced, really. But the daily care and coverage of basic needs at this stage could be done by a robot, by a machine, in such cases that there's no emotion... Or even when we reach a stage of being bedridden. That is, if the case is so severe that the patient is in bed unable to move, or needs someone to feed them or something... And the patient won't recognize if is is me doing it or if it's the neighbor, so in that case it could be a complete replacement. Now in earlier stages, in the case that there is no caregiver, I imagine it could work. But I can't say if it would work the same way. But it will certainly be able to replace the caregiver, perhaps for a pretty long time.

Interviewer: Based on what you said, what exactly are the things it could replace? I mean, what basic needs offered by the caregiver could be replaced by such an application?

Interviewee: General care, help with feeding, help with dressing, help in the bathroom. Saying "come now it is time to eat", "come now it is time to put on your clothes", so giving instructions - something like a program, like having a program installed in your brain that tells you what to do or reminding you about something and helping you. And it could be a permanent presence, for constant guidance and reminder and basic needs of this type. "Let's go to the bathroom now", this is the level it could help. Well, it could also do other things: read to him, maybe even more... Turn on the lights, put some music on… I imagine all these things can be done.

Interviewer: Yes what we said before about the smart home, facilitating...

Interviewee: Turning the lights on when entering a room, or if they wake up at night, telling them where to go, or when they have to be somewhere telling them where to go, so that they are not confused.

Interviewer: Okay so I think the questions came to an end, em…

Interviewee: Great if you need anything, if you have any questions we can keep in touch or you can contact me on my email. I will be very happy to help you, whatever you want! All this is very interesting and I think it has a bright future - because at the moment there is no medicine... Anything that can help these patients is important and we must be open to all methods. We must move forward!

Interviewer: Thank you very much for your time!

Interviewee: Alright, nice to meet you. Good luck, see you!

Interviewer: Goodbye, have a nice day!

## APPENDIX V - Questionnaire consent form

Thank you for your interest in taking part in this research study. This research is being conducted by Iisa Amalia Michael, in fulfilment of her Master's Degree in Interaction Design at the Cyprus University of Technology and Tallinn University.

**1. What is the purpose of the project?**

The primary goal of this research study was to develop a proof of concept of an Augmented reality (AR) application that assists elderly people or mild cognitive impaired patients in their day-to-day activities.

**2. Who can take part?**

The researcher is interested in learning your personal experiences being a caregiver providing assistance to your loved one with Mild Cognitive Impairment. You can take part if you are 18 years old or older and do not have a diagnosis of dementia or other memory loss related conditions.

**3. Do I have to take part?**

No, your participation in this study is voluntary. If you wish to take part, you will be required to provide consent at the bottom of this page. However, if at any time you decide you no longer wish to take part you are free to withdraw, simply by closing the browser tab.

**4. What will I be asked to do?**

You will be asked to answer a set of questions regarding your personal experiences assisting people with dementia or other memory-related impairment. The survey should take you anywhere from 5 to 10 minutes to complete.

**5. What are the possible disadvantages and risks of taking part?**

The study involves your participation in providing your personal views on a set of questions. The researcher values your opinions and hopes that you will find the survey interesting. However, you are free to decline to answer any particular question you do not wish to answer for any reason. There are no other risks anticipated in taking part in this study.

The researcher requests your consent for participation in this study. This consent form asks you to allow the researcher to use your comments to enhance understanding of the topic. The form also asks your permission to use related observations or posts as data in this study.

Please note that this survey does not collect personal email addresses, so your responses are not linked to your personal information.

If you have any questions or would require any further clarification, please contact me at lmichael@idmaster.eu

Thank you in advance for your participation!

**Statement of Consent**

- ❑ I agree to participate in the research study. I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time, without any penalty or consequences.
- ❑ I grant permission for the data generated from this survey to be used in the researcher's publications on this topic.

## APPENDIX VI - Questionnaire

**Demographic related questions:**

1. What is your age group?
2. What is your gender?

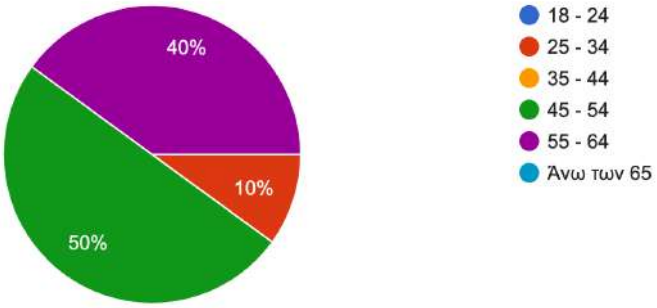
**Personal experience questions:**

3. How long have you been a caregiver for your loved one?
4. How do you help your loved one? What kind of assistance are you providing?
5. In which ways do you provide comfort to your loved one?
6. What is your loved one's ability to independently complete activities of daily living?
7. Do you encourage them to complete certain activities on their own? If yes, what kind of activities?
8. How do you encourage them to participate in local groups and activities that they enjoy?
9. Please rank the following stressors from the most frustrating to the least frustrating for the patient. (1 - Very frustrating, 2 - Frustrating, 3 - Moderately frustrating, 4 - Little frustrating, 5 - Not frustrating)
    - Not being able to remember past memories
    - Psychological stress
    - Not being able to take care of themselves
    - Not being able to communicate effectively
10. In your opinion, do you think technology can assist your loved one? If yes, in which ways?
11. Is there anything else you would like to add?

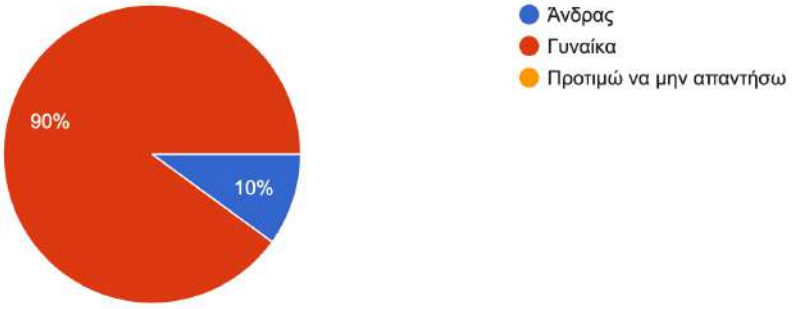
## APPENDIX VII - Questionnaire Responses

### Demographics

1. **What is your age group?**




2. **What is your gender?**




### Personal experience

1. How long have you been a caregiver for your loved one?
    - 2 years
    - 1 έτος
    - Τρία χρόνια
    - Πολύ λίγο αλλά ανυσηχω ΄
    - 3 χρόνια
    - 15 χρόνια
    - 5χρονια
    - 2χρονια

- 1,5 χρόνο
- 1 χρόνο

2. How do you help your loved one? What kind of assistance are you providing?
    - Emotional support
    - Τα πάντα κάνω
    - Το κρατάω στο σπίτι μου
    - Επιτήρηση, προσωπική υγιεινή,(μπάνιο, ξύρισμα, αλλαγή ρούχων), εξασφαλίσει ειδών πρώτης ανάγκης..
    - συχεχής φροντίδα
    - Τα παντα
    - Σιτιση- συντροφια-ιατροφαρμακευτικη περιθαλψη
    - Το φροντιζω
    - Μαγειρεύω, καθαρίζω συζητάω

3. In which ways do you provide comfort to your loved one?
    - Emotional support
    - Χαλιά με αυτοκόλλητο , κουβέντα,παίζουμε χαρτιά
    - Φροντίζοντας να μην αισθάνεται ότι κάτι του συμβαίνει.
    - Με το να συζητάμε το πρόβλημα
    - Φροντίζοντας για όλες τις ανάγκες του
    - παρουσία μου, βοήθεια και απο άλλο άτομο και ότι βοηθημα κυκλοφορεί στην αγορ'α
    - Φροντιζοντας το
    - Συνεχης επικοινωνια με σχεδον συγκατοικηση
    - Της μιλαω, κ της δινω πολυ αγαπη
    - Καθαριότητα και φροντίδα

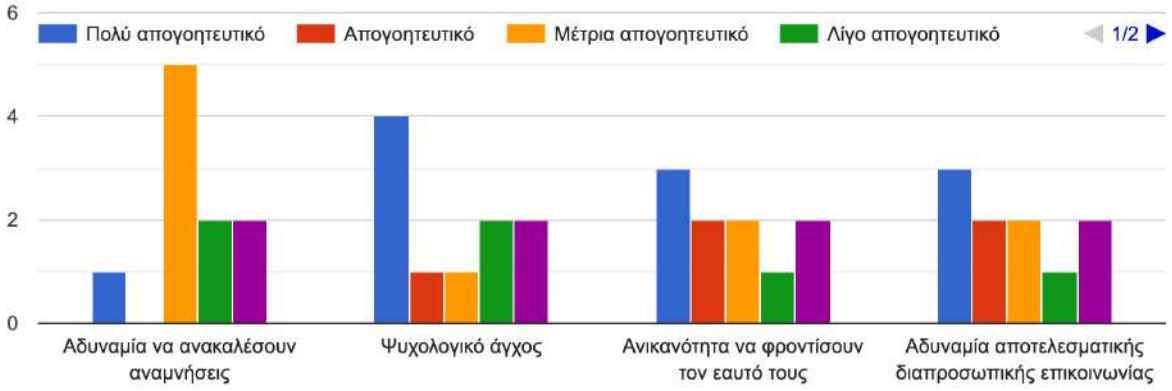
4. What is your loved one's ability to independently complete activities of daily living?
    - Low
    - 20%
    - Καθόλου
    - Μέτρια
    - Ελάχιστα
    - τώρα πλέον καθόλου
    - Είναι αρκετα ικανο
    - Περίπου κατά 60τις εκατό

5. Do you encourage them to complete certain activities on their own? If yes, what kind of activities?
    - No
    - Ναι,να καθαρίζει τα χόρτα,αβγά, ψάρια
    - Να πηγαίνουμε βόλτα, να τρώει μόνο του, να τον πηγαίνω σε ομάδες να συζητάει..
    - Εννοείται νομίζω είμαστε σε αρχικό στάδιο!
    - Να φάει,να πει νερό,να φορέσει τα παπούτσια του..
    - στην αρχή ναι, μέχρι που τον έπαιρνα στην δουλειά μου
    - Οχι
    - Ναι ,προσωπικη καθαριοτητα και καποιες απο τις δουλειες του σπιτιου
    - Τουαλετα, μπανιο, να μαγεορευει
    - Τουαλέτα, φαγητό, ντύσιμο, ιχνογραφια

6. How do you encourage them to participate in local groups and activities that they enjoy?
    - They reject activities
    - Πηγαίνοντας και επιβραβεύοντας την συμμετοχή του!
    - Δεν συμμετάσχει κάπου
    - προσπαθούσα να του κρατώ στην μνήμη του τα αγαπημένα του χόμπι
    - Την προτρεπω να συμμετασχει λεγοντας της οτι θα ειναι με φιλους της
    - Δεν συμμετέχει

- Παρέχοντας πρακτική βοήθεια για να τα εξασκήσει, όπως την ιχνογραφια

7. Please rank the following stressors from the most frustrating to the least frustrating for the patient.




8. In your opinion, do you think technology can assist your loved one? If yes, in which ways?
    - Yes, give them support on every details on how to do things
    - Οχι
    - Τηλεόραση, βιντεοκλήσεις
    - Όταν λείπω στη δουλειά του βάζω στο τάμπλετ παραμυθια που του αφηγούμαι ώστε να νοιώθει την παρουσία μου
    - Ις ας ζ.. αισιοδοξώ για κάποιο φάρμακο !
    - Όχι
    - λίγο
    - Η τηλεοραση ειναι μια μορφη συντροφιας
    - Μέσω της επικοινωνίας
9. Is there anything else you would like to add?
    - No
    - Θυμάται απιστετες λεπτομέρειες του παρελθόντος και δεν θυμάται τι έφαγε το πρωί.
    - Οχι

## APPENDIX VIII - Participatory Design Workshop Consent Form

You are invited to participate in a research study exploring how new technology could be used to support people living with dementia at home. You were selected as a possible participant in this research because of your extensive experience in the anatomy, functions, and organic disorders of nerves and the nervous system.

This research is being carried out by Iisa Amalia Michael, an MSc student in the programme in Interaction Design at the Cyprus University of Technology and Tallinn University. Please read this form and ask questions before you decide whether to participate in the study.

**1. What is the purpose of the project?**
Augmented reality (AR) is a technology that allows digital content to be seen on top of the real world. Iisa's research project explores how augmented reality could be used to help people living with dementia to complete everyday tasks independently at home. The results of these sessions will influence future work exploring how best to design an augmented reality system for people living with dementia.

**2. Procedures**
If you decide to participate, you will be asked to participate in a design workshop provisioning your insights related to your personal experiences in regards to memory loss conditions in a 45-minute to one-hour session, agree to allow the information to be presented to the public in a non-identifying way, and agree to allow other researchers to review the data and transcript of the interview for a reliability check.

**3. Do I have to take part?**
No, it is entirely up to you to decide if you would like to take part. If you wish to take part, you will be required to provide consent at the bottom of this page. However, if at any time you decide you no longer wish to take part in this session you are free to withdraw, without giving a reason.

**4. What are the possible disadvantages and risks of taking part?**
The study involves your active participation in providing valuable information in regards to people with dementia. I value your opinions and hope that you will find the session interesting. However, there is a chance that some participants will find a question difficult to answer, and I understand in this case if you choose not to respond to a question. There are no other risks anticipated in taking part in this study.

**5. Will my participation involve any discomfort or embarrassment?**
No, your participation is entirely anonymous and we do not expect you to feel any discomfort or embarrassment if you take part in this project.

**6. Who will have access to the information that I provide?**
Your responses will be stored online, and these responses will only be accessible by the researchers involved with this project.

**10. What happens if there is a problem?**
If you have a concern about any aspect of the project you should speak to the researcher [Iisa Amalia Michael] who will do their best to answer any questions.
Please confirm that you meet the following inclusion criteria:

- ❏ I confirm that I am at least 18 years old
- ❏ I confirm that I do not have a diagnosis of dementia

**Statement of Consent**
In order to take part in this survey, you must tick all of the boxes below to show your consent to participate. Please read each of the following statements and tick the boxes if you agree.

- ❏ I have been provided with information explaining what participation in this survey involves.
- ❏ I know who to contact if I want to ask questions and discuss this survey.
- ❏ I have received satisfactory answers to any questions I have.
- ❏ I have received enough information about the survey to make a decision about my participation.
- ❏ I understand that I am free to stop participating in the survey without having to give a reason for withdrawing by closing the browser at any time before I submit my responses.
- ❏ I understand that I am free to withdraw my data during the session.
- ❏ I understand the nature and purpose of the procedures involved in this study. These have been communicated to me on the information above.
- ❏ I understand the data I provide will be treated as confidential, and that on completion of the project my name or other identifying information will not be disclosed in any presentation or publication of the research.
- ❏ I hereby fully and freely consent to my participation in this survey.

Please print your name

_____

Please sign your name

_____

Date

_____

## APPENDIX IX - Scenarios Evaluation Questionnaire

**Please confirm that you meet the following criteria**

- ❏ I confirm that I do not have a diagnosis of dementia
- ❏ I confirm that I do not have a visual impairment that will prevent me from commenting on the visual aspects of the videos in this survey

**Informed Consent**

- ❏ I agree to participate in the research study. I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time, without any penalty or consequences.
- ❏ I grant permission for the data generated from this survey to be used in the researcher's publications on this topic.

**Demographic related questions**

1. What is your age group?
2. What is your gender?
3. Please rate the following concepts based on how familiar you are with each of them
    a. Augmented Reality (AR)
    b. Virtual Reality (VR)
    c. Information Technology (IT)
    d. Mild Cognitive Impairment
    e. Dementia

**Scenario 1**

1. Video [https://youtu.be/6p17DnB4TmY]
2. What was the video trying to communicate?
3. What made you think that?

**Scenario 2**

1. Video [https://youtu.be/6p17DnB4TmY]
2. What was the video trying to communicate?
3. What made you think that?

**Scenario 3**

1. Video [https://youtu.be/OkKuHNinHb0]
2. What was the video trying to communicate?
3. What made you think that?

**Scenario 4**

1. Video [https://youtu.be/19eW7YJKBpY]
2. What was the video trying to communicate?
3. What made you think that?

**Scenario 5**

1. Video [https://youtu.be/MmLER_PFPdk]
2. What was the video trying to communicate?
3. What made you think that?

**Scenario 6**

1. Video [https://youtu.be/2j4IDN3yqSU]
2. What was the video trying to communicate?
3. What made you think that?

**Scenario 7**

1. Image


2. What was the image trying to communicate?
3. What made you think that?

**Scenario 8**

1. Image

2. What was the image trying to communicate?
3. What made you think that?

**Scenario 9**

1. Image


2. What was the image trying to communicate?
3. What made you think that?

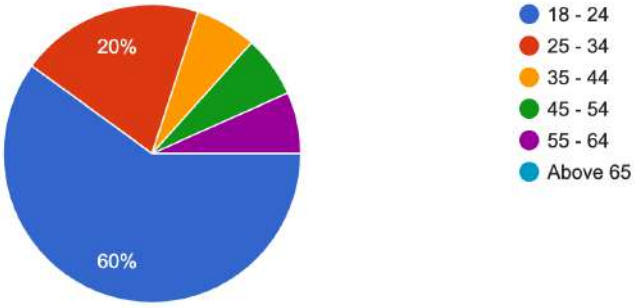
**Scenario 10**

1. Video [https://youtu.be/aDGTL7k5DuY]
2. What was the video trying to communicate?
3. What made you think that?

# APPENDIX X - Scenarios Evaluation Responses

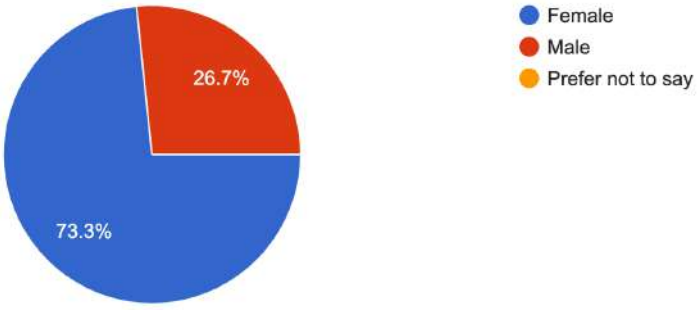
What is your age group?

15 responses

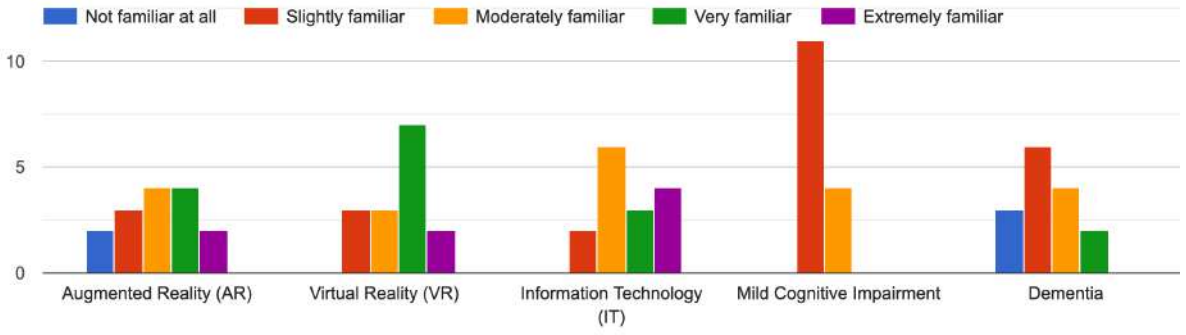



What is your gender?

15 responses




Please rate the following concepts based on how familiar you are with each of them



**Scenarios evaluation**

**Scenario 1**

1. What was the video trying to communicate?
    - How to turn on the water cattle
    - How to turn the kettle on
    - Pull down the switch
    - Instructions on how to switch on the kettle
    - It was guidance video on how to use the kettle
    - Reminds you to put the switch down to make the kettle work
    - How to use/work the kettle
    - how to activate a kettle
    - How turn on the kettle
    - to press the kettle button
    - to touch a certain place: the kettle button
    - Touch
    - How to turn on a kettle
    - How to switch on the kettle
    - tries to tell me to turn off the water switch to boil

2. What made you think that?
    - The virtual hand pointed to the turn on thing
    - The arrow pointing to the switch
    - The hand with the animation
    - The small prompt on the button
    - The finger cursor led me to look at it
    - the arrow and the action
    - the finger is pointing and pushing the button at the bottom
    - the graphic animation and the movement of the hand
    - The augment in the video
    - the moving icon
    - there was an icon on it
    - Kettle

- The visual prompt shaped like a hand pointing to the switch that turns on the kettle
- The icon near the button. (initially I thought "how to make coffee". If the sign was bigger it would be more clear)
- is quite understandable

**Scenario 2**

1. What was the video trying to communicate?
    - Danger e.g. hot
    - The kettle wasnt working
    - Caution its hot
    - The kettle is in a state of emergency (most likely hot, do not touch or do not turn off)
    - It's a warning video to raise awareness of the hot steam coming out of the kettle
    - That a kettle can be dangerous
    - maybe the top of the kettle is hot or should be used with caution
    - there was a indication of something is happening with the kettle but is not specified
    - Watch out when opening the lid
    - that there is a warning
    - that there was something up with the kettle
    - Sound
    - The kettle is currently boiling water
    - Danger. Boiling water
    - says there is a problem

2. What made you think that?
    - The sign is clear, that it may be hot is my interpretation due to experience
    - The warning sign above it
    - The indicator above the boiler

- The warning sign on top of the kettle
- The yellow warning logo right by the steam area
- the yellow triangle warning sign
- the warning sign that pops up at the top of the kettle
- the exclamation mark
- The warning augment
- alert icon
- the was an exclamation mark, which made it seem like it was dangerous
- Noise
- The exclamation sign above the kettle, and the sound of the water boiling
- The icon on top
- it is quite understandable

**Scenario 3**

1. What was the video trying to communicate?
    - Time till the water is ready
    - That it takes 30 seconds to heat up the water
    - The circle with the count down
    - How long the kettle takes to be ready for the next use or how long until the water is boiled
    - It's a video telling you it will take roughly 30 seconds for the water to boil.
    - the amount of time it will take for the kettle to boil
    - the time in which it is complete
    - how much time is left on the kettle
    - How much time the boiling will take
    - timer
    - that there was a time limit for someting?
    - Time
    - The kettle will finish boiling the water in xx seconds
    - Boiling hot water will be ready in 30"
    - shows how long the water will boil

2. What made you think that?
    - The timer above the cattle
    - The timer
    - at first i thought it might be the temperature but then i saw the numbers decrease so its a timer
    - The timer on top of the kettle
    - The timer symbol (that decreases in time as the video plays on)
    - the timer was counting down from 30
    - the 30 second countdown above the kettle
    - the revers timing
    - Count down augment
    - the icon with the numbers
    - there was a countdown
    - Timer
    - The timer prompt above the kettle
    - Countdown
    - I do not find it necessary

**Scenario 4**

1. What was the video trying to communicate?
    - hot
    - That the kettle was hot
    - To hot
    - Kettle is boiling hot, do not touch
    - Warning that the kettle is extremely hot
    - that the kettle is switched on and could be hot
    - the object can be hot to the touch
    - the indication is unclear , is the kettle hot ? it has a problem ?
    - Kettle being hot
    - boiling water indicator
    - That there is something with the kettle
    - Heat

- The kettle has finished working, or the kettle is currently hot
- Hot surface
- it shows me that I have to take the kettle

2. What made you think that?
    - That it is red plus previous experience
    - Because it turned red
    - To hot due to the color but also the switch was on the on position and not the off, it could be that its ready but the switch should have been in the off position
    - The flashing red skin
    - The kettle colour alternating in red and its original colour to signal that the kettle is hot. (I would perceive the colour red as hot in this case)
    - it was flashing a pink / red
    - the blinking red light on the entire object
    - the red light
    - Red color augment
    - red color
    - the colour was changing, signalling that the kettle was important
    - Colour
    - Highlighting the kettle in a bright red color
    - Blinking red colour
    - useful but maybe i wanted some kind of text

**Scenario 5**

1. What was the video trying to communicate?
    - that we need a spoon
    - To use a spoon
    - Missing required item
    - Please place the spoon in the flashing location
    - Telling the viewers that a spoon is needed for the next step to make a cup of coffee

- you may need the spoon to help make your drink
- video error
- no idea . the spoon is missing ? do i need to find it ?
- Supposed place for the spoon?
- stir with a spoon
- That a spoon is needed for the cup?
- Touch
- Probably that you need a spoon, or are missing a spoon
- You need a spoon
- it shows me that I have to take the spoon

2. What made you think that?
    - the spoon lighting up but no real spoon being there
    - The spoon was flashing
    - The blinking spoon was spot on to understand that something is missing
    - The flashing spoon
    - The spoon blinking next to the cup and the coffee beans in a jar
    - the spoon was flashing
    - video error
    - the spoon graphic
    - Augment of a spoon
    - the indication of the spoon
    - There was a spoon icon
    - Spoon
    - Flashing shape of a spoon next to the mug
    - Blinking spoon shape
    - useful but maybe i wanted some kind of text

**Scenario 6**

1. What was the video trying to communicate?
    - that we need a spoon

- That you need a spoon
- Missing spoon
- Please place a spoon on the flashing location
- the same thing as before
- that you will need a spoon to make your drink
- a spoon is necessary or helpful in the situation
- the text is unclear , do I need to find the spoon ?
- Supposed place for a spoon
- absence of spoon
- That a spoon is needed?
- Taste
- Same as the previous question, either missing or needing a spoon
- You need a spoon
- tells me I need a spoon

2. What made you think that?
    - the word spoon lighting up
    - The word flashing
    - Like the previews but with letters, personally im more of a visual type if its down to preference i will liked the spoon as a spoon and not letters, and you break a language barrier
    - The flashing "spoon" visual
    - the same reason but the word "spoon" blinking instead
    - the word spoon was flashing
    - the blinking "spoon" next to the mug
    - the text
    - Augment with spelled 'spoon'
    - the absence of the spoon and the indication with the word
    - There was the word spoon
    - Cup
    - Flashing prompt of the word ‘spoon’
    - Blinking word

- not at all helpful

**Scenario 7**

1. What was the video trying to communicate?
    - To take the mayo from the fridge
    - To use the mayonnaise
    - Get the mayo
    - That the next item to pickup is the HP sauce bottle
    - asking you to grab the mayonnaise
    - for you to pick up the brown sauce
    - Get the Heinz out of the fridge
    - it shoes us what item we need to take from the fridge
    - That you should grab this item
    - grab this product
    - That the heinz needs to be grabbed
    - Touch
    - Prompt the user to grab the mayo
    - Grab the mayo
    - tells me to take an item

2. What made you think that?
    - The sign indication saying that I should grab it
    - Because the Mayo was outlined and it said to use it
    - Its clear that it wants me to grab the mayo although the reason its not apparent to why it says so, as why do i need the mayo ? did i say to it help me spot the mayo ?
    - The "Grab this item" prompt in the AR display
    - the dotted line around the mayonnaise, connected to the instruction tag stating "grab this item"
    - the sign above the bottle
    - it is highlighted and instructing to grab that bottle

- the label and that object is selected
- Text
- that it is selected and next to it writes an explanation (Grab this item!)
- the text and lines
- Item
- Outline of the mayo with label to grab the highlighted item
- Text and outline shape
- the dotted lines are very helpful

**Scenario 8**

1. What was the video trying to communicate?
    - Not sure. I guess to go to the microwave or put something in
    - To move the microwave back
    - How to put food in the microwave
    - That the microwave is now ready to serve the user. Approach microwave and insert item
    - the way to the microwave
    - you need to put something in the microwave
    - the microwave is in use
    - go to the microwave ?
    - Way to the microwave
    - that I have to go to the microwave
    - That something needs to go in the microwave
    - Device
    - Prompt the user to put something in the microwave
    - Focus on this appliance
    - tells me to put something in the microwave

2. What made you think that?
    - the errors
    - The arrow pushing it back

- It tries to show me how to put food in the microwave
- Visual prompt
- dotted line over the microwave (reference to it) and arrows guiding you to the highlighted (i.e., microwave) object
- arrows pointing
- the arrows going into the microwave and it is highlighted by a dashed line
- the arrows
- Augment with signs
- from the arrows
- the colour, arrows, and lines
- Microwave
- The highlighted outline of the microwave with the arrows pointing toward it
- Outline and arrows
- helpful

**Scenario 9**

1. What was the video trying to communicate?
    - The microwave needs to be opened
    - To open the microwave
    - you need to open the microwave door
    - open the microwave
    - Asking you to open the microwave door
    - How to open the microwave
    - Instructions on how to open the microwave to insert food. It points to the handle
    - open the microwave
    - tells me to put something in the microwave
    - to open the microwave
    - Touch
    - How to open the microwave
    - Prompt the user to open the microwave
    - Open the microwave

- Open the microwave

2. What made you think that?
    - The sign saying it
    - The point saying to open the microwave
    - The Circle indication with the letters was more than enough to make it clear, just a suggestion the overlay of the item i find them maybe to much, less is more and something that will enchant your normal vision need to be as discrete as it can, to not burden tha user
    - Visual AR prompt
    - The instruction tag text as well as the circle on the handle
    - the sign above the microwave
    - the microwave is highlighted by a dashed line with a circle on the handle, indicating to open it
    - the text
    - Text
    - from the text
    - The text and lines
    - Microwave
    - Highlighted microwave outline with label that says to open it
    - Outline and text
    - more helpful

**Scenario 10**

1. What was the video trying to communicate?
    - When the microwave will be done
    - It takes 30 seconds to cook
    - Timer
    - Unlike the kettle, this shows a visual timer on how long it will take until the food is heated and ready for consumption.
    - That the microwave will be on for the next 30 seconds

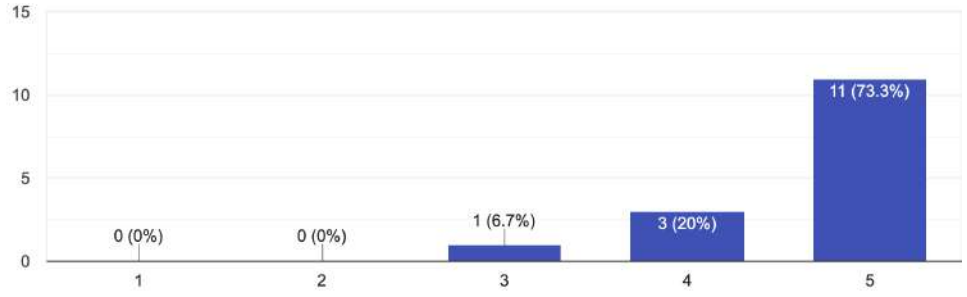
- the amount of time it will take for the microwave to finish
- the countdown until the microwave is done
- how much time is left on the microwave
- Remaining time
- timer
- That the microwave is almost ready
- Time
- The microwave will finish in xx seconds
- It will be ready in 30"
- tells me at what time I should open it

2. What made you think that?
    - The countdown on the surface of the microwave
    - The timer
    - The countdown of the numbers was a clear indication
    - The visual timer prompt in the microwave
    - the timer
    - the timer was counting down from 30
    - visual countdown
    - the reverse clock
    - Count down augment
    - from the numbers
    - the count down
    - Time
    - Timer on the working microwave counting the seconds backwards
    - Countdown
    - not helpful

## Likert Scale

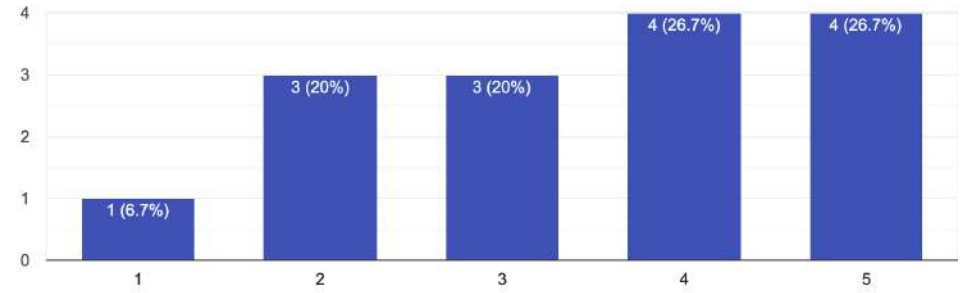
The video clearly tells me how to switch on the kettle

15 responses



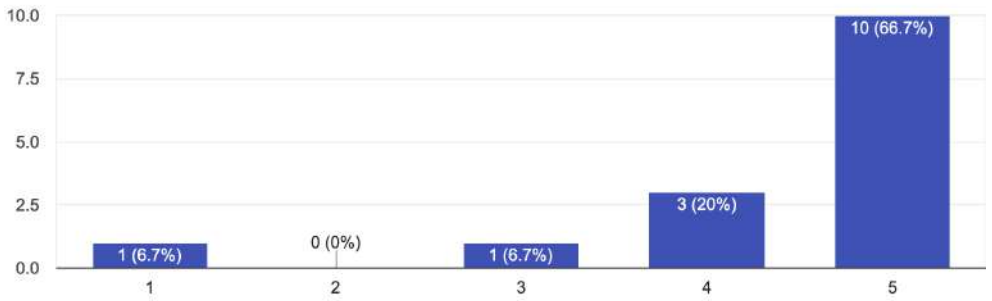

The video clearly tells me that the kettle is in use

15 responses



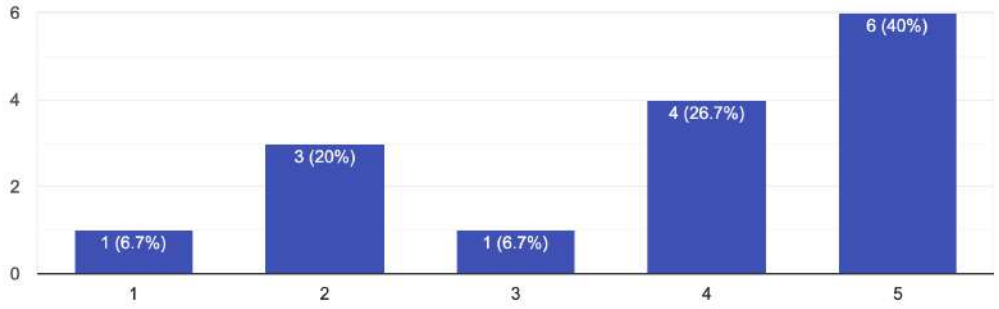

The video clearly tells me to wait for the kettle to boil the water

15 responses



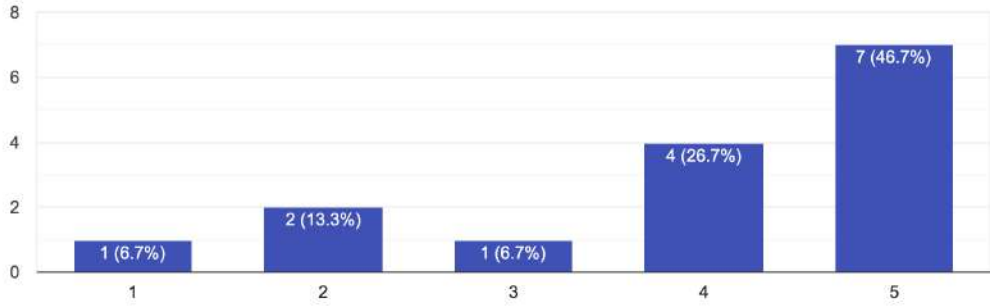
The video clearly tells me that the kettle is hot

15 responses



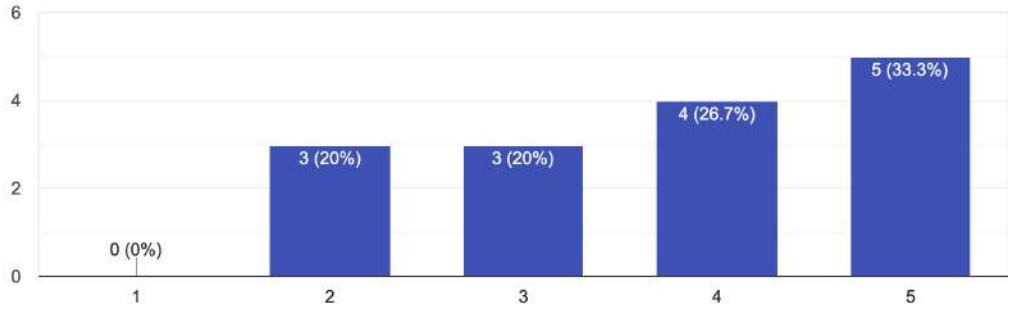

The video clearly tells me to find a teaspoon

15 responses



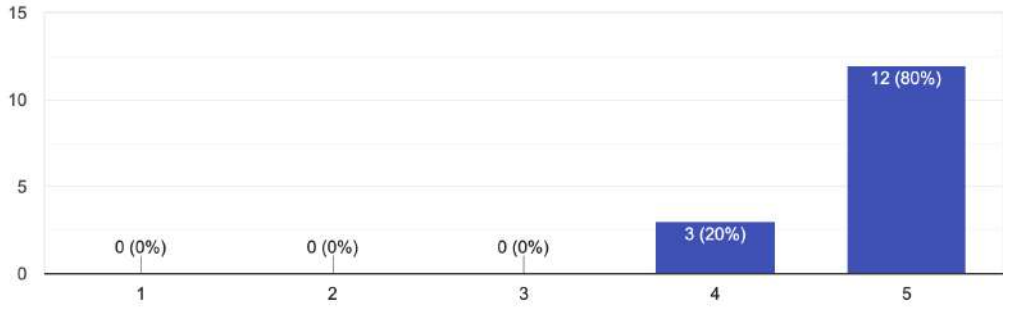

The video clearly tells me to find a teaspoon

15 responses



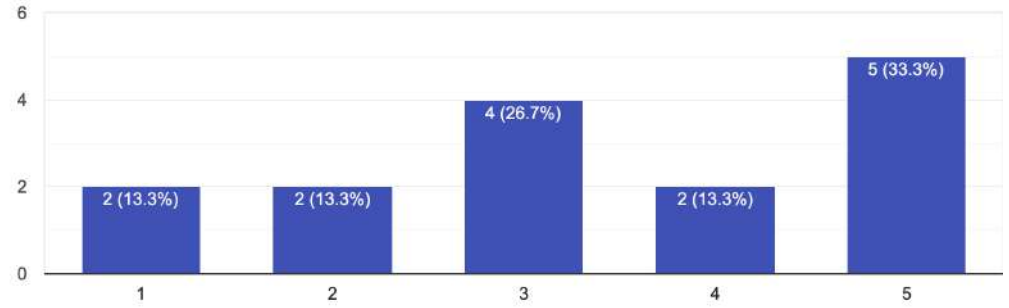
The video clearly tells me which item to take

15 responses



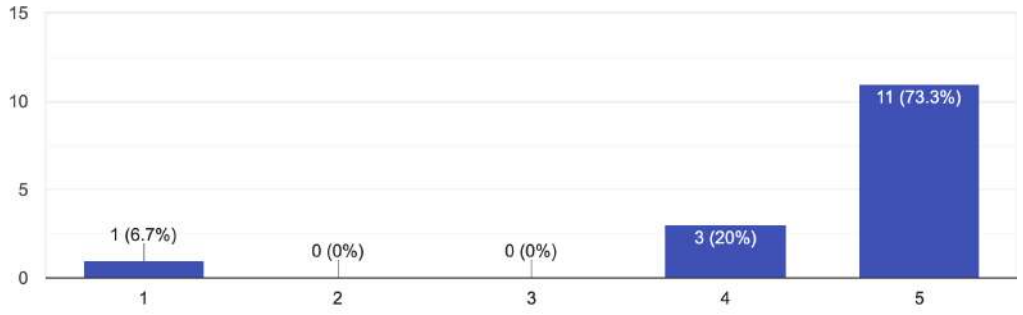

The video clearly tells me where to place my food

15 responses




The video clearly tells me how to open the microwave

15 responses



The video clearly tells me to wait for the microwave to reheat my food

15 responses