



Digital Recommendations for Dementia and Alzheimer's Patients: REMEM Example

Şahin Kapıkıran¹, Ayşe Çakır², Arzum Işıtan^{3*}, Evren Çağlarer⁴, and İbrahim Çakır²

¹Pamukkale University, Faculty of Education, Psychological Counseling and Guidance Department, Denizli, Türkiye, (ORCID: 0000-0002-9693-7660),
skkiran@pau.edu.tr

²Denizli Innovation Association, Denizli, Türkiye, (ORCID: 0000-0002-2353-5265 and ORCID: 0000-0003-1614-0537),
ayseguler135@gmail.com and info@ibrahimcakir.com.tr

³*Pamukkale University, Faculty of Technology, Mechanical Engineering Department, Denizli, Türkiye, (ORCID: 0000-0002-5228-9788),
aisitan@pau.edu.tr

⁴Kırklareli University, Faculty of Technology, Mechatronics Engineering Department, Kırklareli, Türkiye, (ORCID: 0000-0002-1343-4751),
ecaglarer@gmail.com

(5th International Symposium on Innovative Approaches in Smart Technologies– 28-29 May 2022)

(DOI: 10.31590/ejosat.1129642)

ATIF/REFERENCE: Kapıkıran, Ş., Çakır, A., Işıtan, A., Çağlarer, E., & Çakır, İ. (2022). Digital Recommendations for Dementia and Alzheimer's Patients: REMEM Example. *Avrupa Bilim ve Teknoloji Dergisi*, (37), 47-51.

Abstract

Dementia and Alzheimer's disease are affecting more and more people worldwide. According to the World Health Organization, 60-70% of the approximately 55 million people diagnosed with dementia worldwide suffer from Alzheimer's, adding 9.9 million new cases diagnosed each year. While the annual global cost of dementia exceeds \$1 billion, its cost is estimated to double by 2030.

It is stated that new digital technologies and e-health solutions for dementia patients have a strong potential to help individuals face the challenges related to dementia and neurodegenerative disorders. Some examples of e-health solutions for people with dementia are reported as wearable, portable, or implantable devices, depending on appropriate platforms and services, and to support interaction between patients and doctors. New digital technologies are powerful tools to help individuals overcome the challenges of dementia and neurodegenerative disorders. Communication difficulties are common in people with dementia. Meaningful communication initiatives using technology and the Internet can help alleviate symptoms and perhaps lessen their severity. To develop and implement this potential, it is essential to produce solutions that combine health sciences, social sciences, and engineering solutions. With the idea of REMEM, developed with this in mind, with the support of the Turkish National Agency and the European Union, mobile applications aimed at improving memory that can be used not only by dementia and Alzheimer's patients but also by others were examined and a new mobile application called REMEM was developed.

Keywords: Mobile application, E-health solution, Dementia, Alzheimer's, Digital technology.

Demans ve Alzheimer Hastaları için Dijital Öneriler: REMEM Örneği

Öz

Demans ve Alzheimer hastalığı dünya çapında giderek daha fazla insanı etkiliyor. Dünya Sağlık Örgütü'ne göre, dünya çapında demans teşhisi konan yaklaşık 55 milyon kişinin %60-70'i Alzheimer'dan muzdariptir ve buna her yıl teşhis edilen 9,9 milyon yeni vaka eklenmektedir. Demansın yıllık küresel maliyeti 1 milyar doları aşsa da, maliyetinin 2030 yılına kadar iki katına çıkacağı tahmin ediliyor.

Demans hastalarına yönelik yeni dijital teknolojilerin ve e-sağlık çözümlerinin, bireylerin demans ve nörodejeneratif bozukluklarla ilgili zorluklarla yüzleşmelerine yardımcı olacak güçlü bir potansiyele sahip olduğu belirtilmektedir. Demanslı kişiler için e-sağlık çözümlerinin bazı örnekleri, hastalar ve doktorlar arasındaki etkileşimi desteklemek için, uygun platformlara ve hizmetlere bağlı olarak giyilebilir, taşınabilir veya implante edilebilir cihazlar olarak bildirilmektedir. Yeni dijital teknolojiler, bireylerin demans ve nörodejeneratif zorluklarının üstesinden gelmelerine yardımcı olacak güçlü araçlardır. Demanslı kişilerde iletişim güçlükleri yaygındır. Teknolojiyi ve interneti kullanan anlamlı iletişim girişimleri, semptomları hafifletmeye ve belki de ciddiyetlerini azaltmaya yardımcı olabilir. Bu potansiyeli geliştirmek ve uygulamak için sağlık bilimleri, sosyal bilimler ve mühendislik çözümlerini birleştiren çözümler üretmek esastır. Bu düşünceyle geliştirilen REMEM fikri ile Türkiye Ulusal Ajansı ve Avrupa Birliği desteği ile sadece demans ve Alzheimer hastalarının değil, başkalarının da kullanabileceği hafızayı geliştirmeye yönelik mobil uygulamalar incelenmiş ve REMEM adlı yeni bir mobil uygulama geliştirilmiştir.

Anahtar Kelimeler: Mobil Uygulama, E-sağlık Çözümü, Demans, Alzheimer, Dijital Teknoloji.

*Sorumlu Yazar: aisitan@pau.edu.tr
<http://dergipark.gov.tr/ejosat>

1. Introduction

Alzheimer's disease is the most well-known form of dementia and has been known for about 110 years. While it is common for the disease to begin after the age of 65, there are cases where it occurs after the age of 40-50 [1]. In parallel with the increase in the elderly population, the number of Alzheimer's patients is increasing day by day and this situation increases the emotional, social, and economic problems in the society. Alzheimer's disease gradually begins to affect the areas of the brain that control thinking, memory, and language, and the patient's condition usually deteriorates gradually. Although the exact cause of Alzheimer's disease is not known, the disease does not consider gender, geographical location, social class, and ethnicity. There is no definitive treatment for this neurodegenerative disease. Not all forgetfulness should be perceived as dementia and not all dementia is Alzheimer's.

Alzheimer's does not yet have a cure, but treatments for the symptoms are available. Although the current Alzheimer's treatments cannot prevent disease progression, they can slow the worsening of dementia symptoms and improve the quality of life for Alzheimer's patients and their caregivers. Today, there is a worldwide effort to find ways to treat the disease, delay the onset of the disease, and prevent its development.

In addition to the prescription drugs known, today, to delay memory lapses, dementia patients including Alzheimer's, use herbal remedies, dietary supplements, or other alternative treatments such as diet, physical activity, and mental activities. Studies have shown that mental exercises such as puzzles and brain training games can help slow the progression of cognitive problems such as memory loss and decrease in thinking skills.

Although dementia creates communication difficulties in people, it is known that effective communication increases the quality of life of people. The inability to remember the correct words and object names may be due to reduced communication ability. The person may replace a wrong word or find no words at all. As the disease progresses, communication difficulties gradually turn into a lack of communication. Dementia symptoms such as depression, aggression, anxiety, and sleep difficulties are associated with this loss of communication. One of the methods used to alleviate these symptoms is the use of technology and the internet. Considering that about 30 percent of people with dementia experience delusions, this shift in perception is bound to be disturbing for both patients and caregivers. Seeing pictures of familiar faces, watching clips of favorite television shows or favorite singers can help a patient who is confused and frightened to calm down [2].

The European Commission's "Implementation report on the Commission Communication on a European initiative on Alzheimer's disease and other dementias" also states that new digital technologies have strong potential to help individuals face the challenges associated with dementia and neurodegenerative disorders [3]. Some examples of e-health solutions for people with dementia are listed in this report as wearable, portable, or implantable devices that support interaction between patients and doctors, depending on available platforms and services.

In the design process of the REMEM application, which was developed considering these needs, mobile applications, games, and platforms that are used to improve memory and can also be used for early-stage Alzheimer's patients were examined. This

study covers the examination of existing applications, taking into account the benefits of the internet and mobile applications.

2. Benefits of Internet and Mobile Applications

It can be said that technology can contribute to the happiness of the elderly who are healthy or have health problems. In this context, social networks, video calls, and games offer very good solutions [4]. For this reason, Alzheimer's patients can use the internet to do the things they liked to do before or to find new applications that will motivate them. Face-to-face meetings with relatives and people they know through the internet can ensure that the faces are not forgotten. Listening to the songs of their favorite artists and watching their movies can take them to one of their own memories. They should use the Internet and technology to motivate themselves or to do memory exercises. The use of mind games and other computer-based stimulation therapy can shed new light on healthcare professionals, caregivers, and patients themselves.

Innovative technologies such as technologies used to adapt caregiving environments for the cognitive impairment of individuals with dementia or telecare used to support individuals suffering from dementia and their caregivers can facilitate dementia care. Innovative technologies can also help with [2,4,5]:

- Promoting independence and autonomy
- Improving the self-confidence and quality of life of the individual suffering from dementia
- Helping manage potential risks in and around the home
- Supporting people with dementia to live longer in their own home
- Helping memory and recall
- Supporting the person suffering from dementia to maintain some of their abilities
- Providing caregivers with relaxation and helping them feel less stressed

The internet environment, is a part of the daily life of people of all ages, in other words, the virtual world contains many elements of interpersonal communication. It can increase interpersonal communication such as getting to know new people, chatting, sharing ideas, and being a member of various groups. In today's world, people can meet their needs by connecting to the Internet at any time and place during the day, freed from spatial addiction in most cases, such as chatting with friends or relatives, sharing their ideas, or being a member of various groups.

For the elders who have spatial addictions and have difficulty leaving the house due to the health problems brought about by old age, the use of the Internet can offer some opportunities in terms of expressing themselves and communicating with the social environment. The use of the Internet can provide the elders with advantages such as staying in daily life, maintaining communication with the social environment, meeting with friends or relatives who cannot communicate face-to-face, accessing news sources, and obtaining information [2,5]:

- Life satisfaction may increase with Internet use in the elders.
- Their loneliness may decrease.
- It can increase their self-confidence.

- Technology can help bridge the gap between patients and the people around them to improve the quality of life of people with cognitive disabilities.
- Technology tools such as iPods can help people with dementia solve cognitive problems.

Some aiding technologies are focused on increasing safety and reducing risk. The products may not have been designed with the specific needs of individuals suffering from dementia in mind. Therefore, it is anticipated that the individual will comply with the technology rather than the technology is compatible with the individual suffering from dementia. Waiting for the person suffering from dementia to adapt himself/herself without listening to their opinions may affect their willingness to use technology and will have an impact on how successful the application is. Aiding technologies, especially more advanced devices, can also be extremely expensive, especially for elders who pay for their own care. Therefore, there is a need to develop free applications [6].

In mobile applications, it should be aimed to increase the skills of cognitive thinking, communication, making logical decisions, behaving clearly, and using memory actively [2,7,8]:

- There should be games to increase the cognitive skills of dementia patients.
- Mood regulating practices should be included in dementia patients.
- Applications for the care of dementia patients should be included.
- Practices for the physical health of dementia patients should be included.
- Practices should be included to improve the mental state of caregivers resulting from the burden of care.
- Educational information on how to use computers and mobile phones for dementia patients and their caregivers should be included.
- There should be an area where pictures can be uploaded to help dementia patients remember daily events.

Wandering is one of the most common behaviors exhibited by people with dementia and adds to their caregivers' stress on keeping the person with dementia safe [9]. Various digital solutions can be used as a precaution against the wandering problem, such as providing location information with GPS or alerting when leaving the designated area [10,11]. Both approaches provide peace of mind and should include a system to help caregivers find a missing family member as quickly as possible. For location tracking, systems often require dementia patients to carry a GPS-integrated mobile device in a pocket, shoulder or waist bag, or waist belt for continuous monitoring. Applications are being developed that use a registered mobile phone to send geographic information to a server at specified time intervals to monitor patients and alert caregivers according to predefined parameters. In this regard, mobile phones with GPS integrated can also be used [12].

Studies show that using smartphones or iPods helps improve cognitive abilities in Alzheimer's patients. There is a vital need to develop assistive technologies, especially for dementia, which is relatively associated with dementia. It explains that a mobile application that can help Alzheimer's patients better can have vital features. It also helps relieve the mental and economic burden on caregivers as well as on patients [13].

3. Mobile Applications

In the early or mildest stage of dementia, it is very important to get a person to do different activities to help them maintain as much independence as possible, to help keep their brain active, and to slow the onset of mid-stage dementia. Most people today have a smartphone or tablet device with all kinds of apps installed. There are also many applications on the market that can be beneficial for Alzheimer's patients. Some of these applications and their features are given below:

REMEM is an easy-to-use mobile application designed to meet the daily needs of Alzheimer's patients and their caregivers. It was developed within the scope of the KA204- Adult Education project "Click me, if you forgot" supported by the Turkish National Agency. While the REMEM application was being developed, all mobile applications in the application so far were examined. In addition, interviews and surveys were conducted with the patients and their relatives, and their needs and wishes were taken into consideration. So, this application is based on the experience of patients as well as caregivers and their relatives. Users upload photos of people they want and save them with their names. Then they can start playing games with these photos and names. They do photo, word, and sound matching. These games make it easier to remember the appearance and names of these people in daily life as the questions asked in these games are the information of people they know. It is available for free on iOS and Android devices [14].

People with dementia typically have short-term memory problems and may forget to take their regular medication. **Medication Reminder** (MediSafe- Meds & Safe Pill Reminder) application is the one that allows them to alert them when it is time to take various types of medicines and when it is time to reorder a prescription. It was developed for Android mobile phones [15]. People with dementia often forget where they are or where they should be. **Life 360 – Family Locator GPS Tracker** allows family members to track each other, provided the device is with them and GPS is enabled [16]. **MyTherapy Pill Alarm & Reminder**, Health Assistant provides peace of mind to people with dementia and their families. It has comprehensive blood pressure, blood sugar, etc. monitoring features in easy-to-use charts as well as medication reminders. Many physicians also use the MyTherapy application's built-in reports to better understand their patients' progress. It is available for free on Android and iOS [17]. **Elevate Brain Training Games** were designed to improve cognitive skills and increase confidence. This application allows people to do more than 35 different activities and puzzles to improve their brain function. It is available for free on Android and iOS [18]. **Lumosity Brain Training** is an application designed to improve memory, interest, and other cognitive abilities through daily activities and games. This application designed by a team of scientists offers a variety of cognitive and neuropsychological tasks that boost brain function. Available for free on Android and IOS [19]. **Colorfy Colouring for Adults** is an application that provides relaxation. It increases the awareness of the individual and helps focus the mind on something. This application is full of images like flowers, animals, cats, nature, and famous pictures. Available for free on Android and iOS devices [20].

Because people with dementia can feel stressed, depressed, anxious, and sometimes aggressive, sound and images are important to reduce these feelings and help them relax. **Relaxing Sounds** contains a wide variety of soothing nature recordings designed to create a calm relaxing and calming environment for

the listener. Sounds include forest and campfire, sea, river and waterfall, and bird and other animal sounds [21]. Memory loss, confusion, and mental fog can be stressful and distressing for someone with dementia. **HeadSpace Meditation** and mindfulness can be helpful when things are too busy for users and this application guides the user through a series of short meditations. It is free to download initially. However, users will have to pay to unlock additional materials [22]. People with dementia can sometimes lose track of the time of day or night, which can later affect their sleep cycles and lead to insomnia. **Shoothing Sleep Sound** application with soothing sleep sounds is designed to offer sounds that will put you to sleep. It includes an extensive catalog of relaxing music. Available for free on Android and iOS devices [23]. **Memory Box** is an application that contains information about famous people, places, subjects, and events from the 20th century and that can increase communication and help conversations between patient and caregiver. There is also an album to save favorite memories. It is available for free on Android devices [24]. **MindMate**, created by AppInstitute, is for relatives, caregivers, and emergency room personnel working

4. Conclusions and Recommendations

With the aging of the population, an increasing number of people with dementia and Alzheimer's are diagnosed. It can be said that they are the diseases that affect society the most socially, economically, and emotionally. The exact cause of these diseases is unknown and there is no definitive treatment. Along with drug treatment, it is important for the patient to be fed, to be in an environment where they feel safe, and to do usual or new activities. In addition, there are digital solutions developed and recommended to help with medical treatment, slowing down the disease to some extent, and helping to ensure the safety of the patient. Digital applications will be able to help patients more today and in the future.

5. Acknowledge

REMEM project is supported by the Turkish National Agency with project number 2019-1-TR01-KA204-074782 within the scope of Strategic Partnerships in the Field of Adult Education. The project is "Funded by the Erasmus+ Programme of the European Union. However, European Commission and Turkish National Agency cannot be held responsible for any use which may be made of the information contained therein".

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with people with dementia in emergencies. It includes recommendations on how to approach and communicate with someone with moderate to late-stage dementia who may be anxious or upset, as well as guidance on dealing with specific situations. Free and paid versions are available for iOS devices [25]. **A Walk Though Dementia** is an innovative virtual reality application that allows users to understand what life is like for a person with dementia. It uses a combination of 360-degree video sequences and computer-generated environments to show how even the simplest tasks can be difficult for a person with dementia. It is available for free on Android devices [26]. **YoTeCuido Alzheimer** is a very easy-to-use application designed to answer the doubts and questions many caregivers and those affected by Alzheimer's face in their daily lives. Produced by Lapisoft in collaboration with the Association of Relatives of Alzheimer's Patients in A Coruña (AFACO), this company's content is based on the experiences of patients and professional caregivers, as well as caregivers and family members. The application language is Spanish and is available for free on Android [27].

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