Review article

The role of Technology in health care of aging people with Cognitive disorder: a narrative review

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Abstract

Cognitive function plays an important role in everyone's life and the prevalence of cognitive impairment increases with age. According to the statistics, this disease is so common in Iran and the worldwide. Nowadays, technology has helped people with cognitive impairment and their careers in different aspects. This study aimed to review the role of technology in health care status of aging people with cognitive disorder.

We searched Google scholar, Medline, Science Direct, Scopus, ProQues, Ovid, Iranmedex, SID and Magiran. We searched for terms such as "elderly", "aging", "technology", "cognitive impairment", "care giver", "virtual", "Alzheimer", " Dementia", "Telecare", "sensor", "information and communication", "memory training"," assistive device ","smart phone", "Web Base Education" and "Web Based Learning". 1977 related articles from the period of 2005- 2015were found, We checked the reference lists of all papers of included studies for further potentially eligible studies. eventually 17 relevant papers were studied.

Reviewing the obtained articles, showed the positive role of technology in assessing cognitive impairment in early-stages, helping caregivers, improving the quality of health care and memory enhancement in people with Alzheimer's disease. It is suggested to provide Support Services for the elderly with improving infrastructures, such as a careful program planning for responsible organizations, setting the necessary funds, development of interdisciplinary communication, appropriate culture building practices and providing appropriate training in the community and developing communication systems in the country.

Keywords: *elderly, technology, cognitive disorders, caregivers, cognitive assessment.*

Introduction

Cognitive function plays an important role every one's life (1).Cognitive impairment prevalence increases exponentially with age. Cognitive disorders include dementia, delirium and Amnestic disorders (2). Alzheimer's disease is one of the most common reasons of loss of intellectual abilities that is generally named as "dementia" (3). Evidences show that patients with more advanced cognitive disorders, such as dementia, had clinically cognitive problems for a long time. In other words, the risk of dementia in patients with cognitive problems is so high (4).

The risk of Alzheimer's disease is 15 percent for people aged 65 years and 40% for those older than 80 years (5, 6). Alzheimer's disease is the sixth leading cause of death in North America (7)*and one* in *nine Americans, and one* in *eleven Canadians,* aged *65* and older *have Alzheimer's disease*(8). The prevalence of cognitive impairment among the elderly in Ukraine (9), Taiwan (10), India (11), Portugal (12), Spain (13), Malaysia (14) and Korea (15), has been reported respectively: 18.3 percent, 22.2percent, 18 percent, 9.6 percent, 19 percent, 11 percent and 20.5 percent. In a study

that was made out in Iran, the prevalence of symptoms of cognitive disorders in the elderly Amirkola (a city in Mazandaran province) was 18.3 percent also the prevalence of dementia among the aged living in nursing homes in Tehran is reported 43.4 percent, which designates the high prevalence of cognitive impairment among this population (16, 17).

Consequences like: psychological and psychiatric changes and impairment of daily living activities, memory and speech problems, progressive decline in memory and other cognitive functions (judging and thinking) that are the characteristic symptoms of dementia, are the reasons that patients inevitably need the help and supervision of a caregiver their everyday activities (18). In the United States in 2014, payment costs of caring people with Alzheimer's, is estimated to be $ 214 billion (19). Informal caregivers are the main pillar of the system. In Europe, more than 80 percent of all care is the responsibility of informal caregivers which two-thirds of them are women, mostly wives and daughters (20).The long path of the disease and being progressive and incurable, put more pressure on family caregivers who have Alzheimer's patients in their family, this is considered a very significant matter in health care of caregivers these days (21).It is clear that there is a demand for new concepts of care which can supply the same degree of service that exists today (22). In this respect, technology can have an important function in assisting people with dementia and their caregivers (23). Technology for dementia can be defined as: "devices, products or systems that enable those affected directly or indirectly by dementia and cognitive issues to carry out tasks and use their abilities to engage in daily life and society with dignity and autonomy" (24).

With a review of related literature, it has been found that technology can help patients with cognitive impairment and their caregivers in many aspects which include smart houses (25), active monitoring of security at home (26), measuring mobility by advanced detectors (27), rehabilitation (28) and cognitive training (29, 30), tablets with photos to increase memory Remember, Skype (31) and smart phones (32). The review articles that already have carried out, are so old that do not contain new technologies or have not worked specifically on the problem of cognitive disorders (33-36) researchers are always attempting to find ways to control diseases fast and easily and improve the quality of elderly lives. In this context, we can see the progress and development of technology in the field of health and treatment. In consideration of high prevalence of cognitive impairment and its complications in the elderly and the importance of providing appropriate care by caregivers, this study aimed to review the role of technology and improve the health care situation of elderly people with cognitive impairment. We hope that this study opens the door to new research and using new methods of care for improving the health of elderly people.

Method

This study is a narrative review that is carried out through searching in Google scholar, Medline, Science Direct, Scopus, ProQuest, Ovid, Iranmedex, SID and Magiran. Key words used for searching were none specific at first and then became more specific that included: "elderly", " aging", "older people", " ageing", "elder"," technology", "cognitive impairment", "care giver", " virtual", "Alzheimer", " Dementia", "Telecare", "sensor", "information and communication", "memory training", "assistive device", "smart phone "," Web Base Education " and " Web Based Learning ".Criteria for inclusion were the intervention studies that had at least an abstract in Persian or English and have been published in the period 2005-2015. The population of the elderly (older than 55 years) was considered. There was no limitation in gender, culture and the type of technology. Studies that didn't have the inclusion criteria and their full text in Farsi or English was not available were excluded. 1977 related articles were found in databases that with surveying their titles, 1852 were excluded. The abstract of 125 articles reviewed. We checked the reference lists of all papers of included studies for further potentially eligible studies. And finally 17 articles which have available full texts were studied based on priority intervention study entry criteria.

Results

In this study, we reviewed published studies from 2005 to 2015 that examined effects the use of technology in elderly people with cognitive disorders. In this regard articles are divided into 3 categories: Articles related to assessment of elderly with cognitive impairment (7articles), helping caregivers of patients with cognitive impairment (4 articles), Improving the care and improvement of elderly people's memory (6 articles). These categories will be explained as follows:

- Assessment of elderly with cognitive impairment

Continuous monitoring of cognitive function leads to identify the early signs and facilitates interventions. In this case, the effects on individuals also reduced cognitive decline. Assessment of cognitive function is commonly done in clinical fields. Face to face assessment by trained neuropsychologist used manpower and a lot of time and also is too expensive (37). Today, with

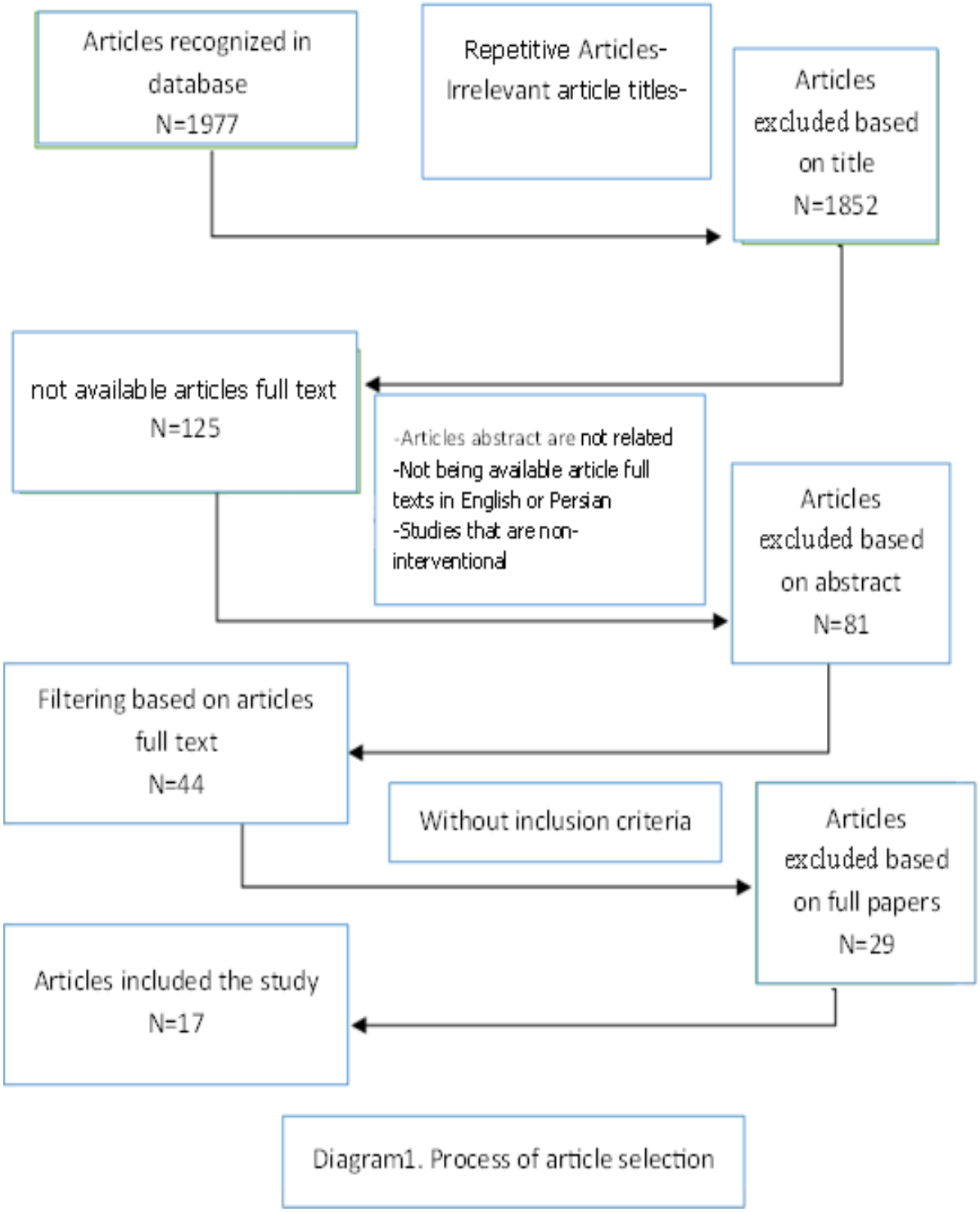

Diagram1. Process of article selection

Table 1: Summary of studies to assess the understanding and performance of the elderly with cognitive impairment by technology

First author, year	purpose	sample	The technology used	Measuring outcomes	Findings	Conclusion
M. Allard 2014	Detection of cognitive decline	60 elderly rural residents	Utilize the "personal digital devices" (PDA)	Monitoring of behavior, semantic memory performance (with Isaacs Set Test and Wechsler Similarities) and daily life experiences	Scores for mobile semantic memory tests were significantly correlated with baseline neuropsychological test scores for Similarities (γ = 0.316, t = 2.096, p<0.05). Intellectually stimulating activities (crossword puzzles, reading) were prospectively associated with increases in semantic memory performance (γ = 0.893, t = 2.431, p<0.05).	Mobile technologies to the field of dementia risk and, more broadly, as a complement to traditional clinical instruments.
P. Allain 2014	Test the utility of a non-immersive virtual coffee task (NI-VCT) for assessment of IADL in Alzheimer's disease (AD) patients.	The patient sample consisted of 24 individuals with a diagnosis of probable AD and 32 subjects served as healthy controls.	Nonimmersive Virtual Reality Kitchen	-Informant-based functional assessment was completed by the four-item version of the Lawton-Brody IADL scale -MMSE -Frontal Assessment Battery	Correlations indicated that more action errors were associated with more impaired scores on neuropsychological tests. There were significant correlations between three NI-VCT measures and the caregiver IADL rating: time to complete (r=-. 50; p=. 01), total errors (r=-. 44; p=. 04) and commission error (r=-. 47; p=. 02).	The results provide initial support for the utility of the virtual kitchen for assessment of IADL in AD patients.
S. D'Arcy 2013	The assessments suitability of using automated Interactive Voice Response (IVR) technology to deliver a suite of cognitive assessments to older adults using speech as the input modality	61 elderly participants ‹The cohort was split into two groups and a crossover experimental design used.	Automated Interactive Voice Response technology	-Days of the week backwards (DOW) -Word Recall Immediate (WRI) -Word Recall Delayed (WRD) -Category Fluency (CF) - The Positive and Negative Affect Schedule (PANAS)	Analysis of Group 1 found a good interclass correlation for WRI (0.82) and DOW (0.87) but poor ICCs for WRD (0.51) and CF (0.61). Group 2 demonstrated more stable but somewhat lower correlations for each of the cognitive tasks.	IVR technology can be a worthy platform for administering cognitive assessments, but has also highlighted the need to review current cognitive assessments in terms of administering them Via non-traditional methods.
G.Sacco 2012	Is possible using a video monitoring system to obtain a quantifiable assessment of instrumental activities of day-to-day living (IADLs) in AD and in MCI?	64 participants over 65 years old were included: 16 AD matched with 10 NC for protocol 1 (P1) and 19 MCI matched with 19 NC for protocol 2 (P2).	"Smart home" equipped with two video cameras And everyday objects for use in activities of daily living.	Daily activity scenario (DAS) scores.	In P1, the DAS score differentiated AD (DASAD, P1 = 0.47, 95% confidence interval [CI] 0.38–0.56) from NC (DASNC, P1 = 0.71, 95% CI 0.68–0.74). In P2, the DAS score differentiated MCI (DASMCI, P2 = 0.11, 95% CI 0.05–0.16) and NC (DASNC, P2 = 0.36, 95% CI 0.26–0.45).	The technology, to better assess functional impairment in Alzheimer's disease and mild cognitive impairment helps.
R. Romdhane 2012	The overall aim of the project is to develop a technological approach for behavioral assessment and preventative care in early and moderate stage AD.	Three participants: two AD patients and one elderly control participant	Automatic video monitoring system	The assessment of each participant of the work was executed with an automatic video monitoring system composed of a vision component and an event recognition component.	The control participant performed all activities faster than the two AD participants. AD participants were not able to follow the correct order of the tasks and even omitted some of them.	Once the technique has been standardized, it could significantly enhance the assessment of AD patients in both clinical and clinical trial settings as well as providing further information regarding patient frailty that could enhance their safety and ease caregiver burden.
CM. Cullum 2006	Assessment of neuropsychological tests through video conferencing	14 older persons with mild cognitive impairment (MCI) And 19 persons with mild to moderate Alzheimer's disease (AD)	Videoconferencing (VC) technology	-MMSE -Hopkins Verbal Learning Test–Revised (HVLT-R) -Clock Drawing Test -Digit Span -Category Fluency -Letter fluency -15-item versions of The Boston Naming Test	Correlations for Cognitive Tests Administered Via VC and Face-to-face: -MMSE: 0.88 - HVLT-R total recall: 0.77 - HVLT-R retention %: 0.54 - HVLT-R recognition: 0.68 - Digit span total: 0.78 - Category fluency: 0.58 - Letter fluency: 0.83 - BNT (15 item):0.87	Highly similar test scores were obtained when participants were tested in-person or via VC. Telecognitive assessment appears to be a valid means to conduct neuropsychological evaluation of older adults with cognitive impairment.

Table 1: Summary of studies to assess the understanding and performance of the elderly with cognitive impairment by technology

Table 2: Summary of articles related to technology and caregivers of patients with cognitive impairment.

First author, year	purpose	sample	The technology used	Measuring outcomes	Findings	Conclusion
S. Werner 2012	Clarify the relationship between caregiving burden and out-of-home mobility of care-recipients using Global Positioning Systems (GPS) technology.	Seventy-six dyads (care-recipients and caregivers) were recruited from a Psychogeriatric center	Global Positioning Systems (GPS) technology.	-Care recipient's depression was assessed in the clinic using the Geriatric Depression Scale (GDS) -Neuro-Psychiatric Inventory (NPI) -Positive and Negative Affect Schedule (PANAS) -Life satisfaction -Caregivers were asked to report if their care recipient ever exhibited wandering behavior. - Algase Wandering Scale (AWS)	Among caregivers of care-recipients with mild dementia, there was a strong negative correlation between burden and a number of mobility variables: average number of visits nodes ($r = -0.50$, $p = 0.05$), average time spent walking ($r = -0.67$, $p = 0.005$), and average number of walking tracks per day ($r = -0.60$, $p = 0.014$). This indicates that greater mobility is related to lower burden among caregivers of care recipients with mild dementia.	The findings emphasize the importance of maintaining older persons' out-of-home mobility during cognitive decline.
T. Holthe 2010	Evaluate the services provided through an individual internet-based digital plan displayed as a calendar page	With seven older people and their family carers from the municipality of Trondheim	Digital calendar and message board	Data collection regarding use, usability, utility and acceptance took place on a regular basis after a preset schedule.	Descriptive analysis was created.	Digital calendar with a message board demonstrated the potential to support older people at home, particularly older people with memory problems who need support in structuring the day and keeping an overview of their daily activities and appointments.
M. Laila 2008	Evaluate the feasibility, acceptability and the usefulness of an electronic tracking device for demented elderly patients living at home or residing in an institution.	18patients: 7 men and 11 women, with an average age of 71 years	Electronic tracking system	-Tolerance by patients -Healthcare personnel's initial acceptance of the Device.	In the preliminary phase of the study 7 patients out of 18 (38%) immediately refused to carry the device. By shifting the location of the device, 3 of these 7 patients (43%) accepted to carry it while 4 (57%) refused to carry it definitively. According to the questionnaire filled out by 12 health care givers at the beginning of the study most estimated that this device could ensure the security of demented elderly patients (9/12: 75%), improve their quality of life (9/12: 75%) and reduce anxiety for healthcare providers (10/12: 83%).	The electronic tracking technology would play a very significant role in managing wandering in demented elderly patients and triggered a very favorable response from healthcare professionals regarding the usefulness and benefits of integration this technology in their daily practice.
N. Beauchamp 2005	Evaluate the efficacy of a multimedia support program delivered over the Internet to employed family caregivers of persons with dementia	299 employed family caregivers	Internet Multimedia Program	- Self-Efficacy - Coping Skills - Caregiver Strain Instrument developed by the Benjamin Rose Research Institute - Satisfaction Survey	Stress, self-efficacy, intentions to get support, depression and Strain of caregivers in the intervention group compared with the control group had a significant improvement ($P<0.001$ ،$P<0.016$ ، $P<0.002$ ،$P<0.009$ ، $P<0.030$).	Interactive multimedia interventions delivered over the Internet appear to be uniquely suited to provide low-cost, effective, convenient, individually tailored programs that present educational information, cognitive and behavioral skills, and effective learning opportunities.

Table 3: Summary of studies related to technology and improve the care of patients with cognitive impairment

First author, year	purpose	sample	The technology used	Measuring outcomes	Findings	Conclusion
MA. Boustani 2012	Evaluate the efficacy of a clinical decision support system (CDSS) to improve the quality of care for hospitalized older adults with CI.	424patients (225 intervention, 199control) with Cognitive Impairment (CI) were	Clinical decision support system (CDSS)	Orders with a geriatric consult and discontinuation orders of Foley catheterization, physical restraints, or anticholinergic drugs.	There were no differences between the intervention and the control groups in geriatric consult orders (56% vs 49%, P =0. 21); discontinuation orders for Foley catheter (61.7% vs 64.6%, P=0. 86); physical restraints (4.8% vs0%, P=0. 86), or anticholinergic drugs (48.9% vs 31.2%, P=0. 11).	A simple screening program for CI followed by a CDSS did not change physician prescribing behaviors or improve the process of care for hospitalized older adults with CI.
DW. Man 2011	Evaluate the effectiveness of a virtual reality (VR) -based memory training for older adults with questionable dementia.	Twenty and 24 older adults with questionable dementia were randomly assigned to a VR-based and a therapist-led memory training group, respectively.	Virtual reality-based memory training program	-Multifactorial Memory Questionnaire and Fuld -Object Memory Evaluation.	Both groups demonstrated positive training effects, with the VR group showing greater improvement in objective memory performance and the non-VR group showing better subjective memory subtest results in the Multifactorial Memory Questionnaire.	The use of VR seems to be acceptable for older adults with questionable dementia.
AM. Seelye 2013	Examine whether individuals with MCI would benefit from receiving prompts when errors occurred during compilation of eight scripted IADLs in an experimenter-assisted smart apartment environment.	30 individuals who met criteria for multi-domain MCI, 23 individuals who met criteria for single-domain MCI, and 50 healthy older adult controls participated	Smart environment prompting technologies	-Memory Assessment Scale Story Memory subtest -Trail Making Test -Delis-Kaplan Executive Function System Design Fluency Subtest	Multi-domain MCI group received more prompt (P<0.05) and required that more activity steps be prompted (P<0.05) than the single-domain MCI and healthy older adult groups.	Future IADL prompting technologies can be tailored specifically for individuals with MCI.
G. Optale 2010	Assessment VR training intervention to lessen the cognitive decline and improve memory functions	36elderly residents of a rest care facility who were impaired on the Verbal Story Recall Test	Virtual Reality Memory Training (VRMT)	Neuropsychological and function evaluations were performed	The experimental group showed significant improvements in memory tests, especially in long-term recall with an effect size of 0.7 and in several other aspects of cognition.	VRMT may improve memory function in elderly adults by enhancing focused attention

the help of different technologies it is possible to assess the elderly cognitive and daily function (37, 38).Through this valuable service can be provided to the elderly in rural areas (39). Cullum and colleagues (39) showed neurocognitive assessment of people by remote sensing, with the help of video conferencing, is a valid tool for investigating neuropsychological elderly with cognitive disorders. In this study the high correlation between common face-to-face neuropsychological tests and via video-conference reported (table 1).
D'Arcy and colleagues (37) use automated Interactive Voice Response (IVR) technology to present a suite of cognitive assessments to older adults using speech as the input modality. Three out of five tests of MMSE (language and understanding, registration and recall information and computation) that can be used in IVR were used. For all participants (61 older) tests conducted face-to-face and via IVR. The student T - test showed a significant difference between the two

groups, for both cognitive testing and assessment for each of the three periods (P <0.05). The study showed that the IVR technology is suitable for cognitive assessment.

Allard and colleagues (40) study on the "personal digital devices" (PDA) to record daily life activities and evaluation of semantic memory in elderly rural residents. At baseline inclusion in the cohort, participants were administered a neuropsychological test battery. A follow-up was conducted on average 2.5 years (SD = 0.21) later and included morphological MRI. A subgroup of subjects completing MRI (n = 81) were also offered participation in a one-week period of ambulatory monitoring of cognition and behavior with using a hand-held PDA. The mobile assessment presented participants with questions of daily life experiences including activities and behaviors performed since the last assessment, their location, and their social company. Scores of mobile semantic memory tests have correlated significantly with basic neuropsychological test scores (P <0.05). In relation to age, gender, educations were not seen significant correlation with the size of neuropsychological tests and right and left hippocampus scores at first of study and later. Although, the number of correct answers on tests of semantic memory Mobile had correlation with left (p <0.01) and right (p <0.01) hippocampus sizes. Mobile semantic memory scores associated with the activities and everyday behaviors were analyzed. Social relations, livelihood and health, physical activity and watching TV does not affect memory performance but mental activities such as puzzles associated with semantic memory (p <0.05). These findings suggest that the PDA is a new tool and a powerful complementary technology to traditional clinical tools, to detect the early stages of cognitive decline.
With the progression of cognitive disorders, performance decreases, so its identifying is important. Sacco and colleagues (41) designed a "smart home" that was equipped with two cameras and everyday objects .He explore the IADL in older people with Alzheimer's disease and mild cognitive impairment pay. In Protocol 1 we had Alzheimer's patients with a control group and in the protocol 2; we had Mild Cognitive Impairment (MCI) with a control group. Protocol 1 The Daily activity scenario (DAS) for Alzheimer Disease (AD) (DAS.AD, P1 = 0.47, 95% confidence interval [CI] 0.38-0.56) different from the group (NC) Normal Control (DAS.NC, P1 = 0.71, 95% CI: 0.68-0.74). In protocol 2, DAS score for MCI (DAS.MCI, P2 = 0.11, 95% CI: 0.05-0.16) different from the NC (DAS.NC, P2 = 0.36, 95% CI: 0.26-0.45). The results showed the derived DAS scores provide a pragmatic, ecological, objective measurement which may improve the prediction of future dementia, be used as an outcome measurement in clinical trials and lead to earlier therapeutic intervention.
In this regard, Allain and colleagues (38) to determine the daily functional disorders in Alzheimer's disease (AD) used virtual and non-invasive test to prepare coffee. In this study, elderly people with Alzheimer's and healthy elderly (HE) as controls, were present. Also, they were asked to prepare for real coffee. Groups of AD more time to prepare their coffee (P <0.0001). AD of 14 steps, fewer steps did (P <0.0001). Total errors in AD were more than HE (P <0.0001). Sarah and colleagues (42) evaluated Modified Telephone Interview for Cognitive Status (TICS-M) in the Detection of Amnestic Mild Cognitive Impairment. Participants were 71 community-dwelling older adults age 65 and over. The authors reported the TICS-M should only be considered a screening tool of cognitive impairment and it’s cutoff score between 33 and 34.
Other information related to any of the papers presented in Table 1. As has been reviewing articles can be realized effective role of new technologies in cognitive and functional assessment of elderly people with cognitive disorders, that this method can include virtual shopping tests, cognitive assessment remotely by video conference, early detection of drop Understanding the handheld personal digital device (PDA), daily

functioning in Alzheimer's disease diagnosis by virtual testing coffee preparation, appraisal through automated Interactive Voice Response technology, tracking daily living activities in patients with Alzheimer's disease with the help of smart home, evaluation The symptoms of Alzheimer's disease with the help of sensors installed in the home.

Helping caregivers of patients with cognitive impairment

Care of patients with cognitive impairment especially Alzheimer's dementia is the most challenge for caregivers. Some researchers named the elderly patients, caregivers as hidden patients and showed these individuals are at risk for mental -physical and social problems (43). Landy writes with increasing hours of care the caregiver burden increases (44). It is estimated that 90% of people with Alzheimer's lived in their homes and family members are responsible for the care of them in 80% especially women (45). To provide services and accurate care for the elderly and their caregiver some studies done. Beauchamp and colleagues (46) evaluated the efficacy of a multimedia support program delivered over the Internet to employed family caregivers of persons with dementia. "Caregiver's Friend" Program which consists of text and video content was prepared to provide to caregivers. Results From the Repeated Measures ANOVAs, showed the intervention group compared with the control group had significant improvement in stress (p.<,.001), self-efficacy (p.<,.016) intention to get support (p.<,.002) caregiver strain(p.<,.028) caregiver gain (p.<,.021) depressive symptoms(p.<,. 009) and state anxiety (p.<,.030). Holthe and Walderhaug (22) presented the findings from the proof of concept applications (POCA) development and trial in Norway. They evaluated the services provided through an individual internet-based digital plan displayed as a calendar page among older people with and without dementia. At the end of the study participants were interviewed. Internet-based digital calendar capabilities in health care have great potential. For patients and people with cognitive impairment can be useful and helpful. And makes sense to charge for activities of daily living and have no dependency on the family can be at home.

Another technology that is related to elderly patients with cognitive impairments are considered, is an electronic detector. Laila and colleagues (47) used in their study of electronic tracking system for elderly dementia. Caregivers completed a questionnaire about the operation of the system, the problems of the system, the level of satisfaction, tolerance and acceptance of units by the elderly. The results showed that electronic tracking system plays an important role in the management of the wandering elderly with dementia. It will can make changes such as putting in the right place and the right size to be hidden, used to enhance the quality of life of demented elderly patients and decrease their caregiver stress. Werner and colleagues (48) used global positioning systems (GPS) to determine the relationship between caregiving burden and out-of-home mobility of care-recipients. The correlation between mobility and the burden of care in the three groups tested؛ in the healthy elderly caregivers group and MCI, there was no associated. While the burden of caring for the elderly with dementia and mobility in older people, there was a strong negative. The average number of stop over 5 minutes ($r = -0.50$, $p = 0.05$), mean time to walk ($r = -0.67$, $p = 0.005$), average walking times between stops per day ($r = -0.60$, $p = 0.014$) were associated with the burden of caring for the elderly. Caregiving burden was associated with lower cognitive status, and poor behavioral/emotional status among the care recipients. Caregivers of care-recipients who spent less time walking out-of-home reported greater burden.

The above literature review, shows the technology as an aid in the care of elderly people with cognitive impairment by reducing stress and improve care and services to help seniors. Some of these technologies include: electronic detectors and Internet-based software that allows communication between the elderly and caregivers as well as between caregivers and medical staff to provide services.

-Care and memory upgrades

According to researches, several studies have done on the impact of technology in improving the care and improvement of elderly people's memory. New computer games designed to cognitive improvement of the elderly people. Virtual reality, as a game designed for elderly people. Some studies indicated that the games had a positive impact on elderly memory. Man and colleagues (49) evaluated a virtual reality-based memory training program for Hong Kong Chinese older adults with questionable dementia. VR is a virtual environment where the interior of a home and a shopping center design. Data analysis showed a significant interaction effect (time and group) for the Fuld Object Memory Evaluation (FOME) in the total reminders ($p < 0.001$) and a reminder delay ($p < 0.001$) and Multifactorial Memory Questionnaire (MMQ) in the content ($p < 0.001$). The study revealed a significant main effect of time for all FOME subscales and the three MMQ subscales, whereas a significant main effect of group was found for FOME (total recall, delayed recall) and

MMQ (contentment). As well as analysis showed the VR group showed greater improvement in objective memory performance and the non-VR group showed better subjective memory subtest according study questionnaires

Optale and colleagues (50) evaluated VR training intervention to lessen cognitive decline and improve memory functions. The intervention group spent 6 months training storage virtual reality memory training which included auditory stimulation and VR experience in path finding. The EG showed significant improvements in memory tests, especially in long-term recall with an effect size of 0.7 and in several other aspects of cognition. Seelye (51) assessed smart technology environment, to improve the daily activities of people with mild cognitive impairment. For this study entry, living room, dining room and kitchen of an on-campus apartment test bed were equipped with motion, object, and pressure sensors, three video cameras, and two laptop computers with speakers, one in the living room and one in the kitchen. Participants performed list of eight activities that are non-invasive and represents the daily routine activities. Multi-domain MCI group received lower activity completion quality ratings than the healthy older adult group ($p < .01$). The multi-domain MCI group received higher assistance ratings than both the single-domain MCI group and healthy older adults ($p < .01$).These findings suggest the technology related to notifications IADL, especially for people with mild cognitive impairment can be used.

The technology is also being used in clinical care, so that Boustani and colleagues (52) used by clinical decision support system (CDSS) to improve the quality of care for elderly patients with cognitive impairment. Each time a physician enters an order for a patient randomized to the intervention arm, the physician received non-interruptive alerts of the presence of CI, Foley catheter, physical restraints, anticholinergic drugs, or the need for Acute Care for Elders (ACE) services; For example, if doctor anticholinergic each of the 18 was inappropriate, alert the proper drug withdrawal and replacement or receiving low-dose drug. Data analysis, the difference between the intervention group and the control group was not observed in geriatric consult orders (56%vs 49%, p=0.21); order the cessation of use of the Foley catheter (61.7% vs 6/64 %, P = 0/086); physical restraints (4.8% vs 0%, P=0.86); anticholinergic drugs (48.9% vs 31.2%, P=0.11). In this study use of CDSS has not been reported to be effective may be due to a lack of awareness on the importance of geriatric consult, especially elderly people with cognitive impairment.

Yamaguchi and colleagues (53) presented a Dual-Modal Virtual Reality Kitchen for (Re) learning of everyday cooking activities in Alzheimer's disease. In this study tested two learning methods in a VR environment: one based on step-by-step verbal

written instructions and the other using rehearsal aloud of instructions. The tasks focused on two activities of daily living: cooking breakfast and making coffee. Two patients with Alzheimer's disease and two healthy elderly controls were tested. All subjects tested the two (re)learning methods. Results showed that both of the error reduction learning methods were of value and help to improve the performance of everyday actions in both healthy elderly and Alzheimer's disease patients. Results from an intervention study(54) (N=7) of the virtual supermarket as a tool for training executive functions (EF) in people with mild cognitive impairment showed four participants improved their EF as assessed by the WebNeuro and four improved their performance of the shopping task in the Multiple Errands Test.

-Conclusion

Elderly is a natural phenomenon in human life that occurs over time with physiological changes in the human body. Although this phenomenon cannot be prevented, but with caring, we can provide a condition for elderly to spend a good time. Technology can help us in this. New and innovative assistive technologies have been traded gradually for supporting of the elderly with cognitive impairment or dementia to help this group to live more independently. The most important criteria for the success of such technologies are: being user-friendly, cost effectiveness and their Stability. These are some of the consequences of using technology in patients with dementia: reducing the burden, improving independence, social assistance, improving quality of life and positive impact on daily living activities and participating in happy meetings (24).

With reviewing the articles, we can see the positive role of technology in assessment of cognitive impairment in early-stages, helping caregivers of patients with cognitive impairment, Improving the care and improvement of elderly people's memory.

The role of the Internet is very important. The use of the Internet can help the brain power of middle aged people and elderly and "web browsing" reduces the risk of Amnesia diseases by aging, it is necessary to provide appropriate infrastructures for the elderly. These developments can reduce the patients' costs and transportations and can save the time of physician and patient very well (55). However, there are many challenges in using these

tools, that one of the most important of them is moral challenge.

At the end, with emphasis on the role of technology in various aspects of assessment, care and improving memory of elderly patients with cognitive impairment, It is recommended to provide *Support Services* for the elderly with improving infrastructures, including a careful program planning for responsible organizations, setting the necessary funds, development of interdisciplinary communication, appropriate culture *building* practices and providing appropriate training in the community and developing communication systems in the country.

Acknowledgements

This research is a result of the research project that Approved by the student Research Center of Medical Sciences of Mazandaran University, Number 179, in 2016.Thereby would be appreciated the financial support of Research and Technology Assistance of Mazandaran Medical Sciences University.

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