

Review of literature on effectiveness of cognitive rehabilitation on Alzheimer's disease and mild cognitive impairment

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Keywords

Alzheimer's disease, cognitive rehabilitation, mild cognitive impairment, cognitive intervention

Anahtar kelimeler

Alzheimer hastalığı, bilişsel rehabilitasyon, hafif bilişsel bozukluk, bilişsel müdahale

Abstract

Alzheimer's disease (AD) and mild cognitive impairment (MCI) have taken their place among the most common neurodegenerative diseases by affecting countless people around the world. Mild cognitive impairment can be defined as the earliest stage of deterioration in cognitive functions. While impairment in more than one cognitive domain can be seen in MCI, it is seen that individuals can show some level of functionality in daily life. Also, Alzheimer's and MCI cause degeneration in some parts of the brain (parietal lobe, frontal lobe, temporal lobe), and disease progresses, and shrinkage may occur in some brain regions. Thus, a series of intervention techniques have been introduced to improve the daily living activities of individuals diagnosed with Alzheimer's and MCI. Cognitive rehabilitation is an individualized process that focuses on improving daily living activities. Furthermore, the effectiveness of cognitive rehabilitation on Alzheimer's disease and MCI in numerous cognitive domains is proven by different researchers. Different researchers prove that different cognitive rehabilitation programs effectively improve the cognitive, social, and psychological domains of individuals' lives. Therefore, this literature review aims to examine the effectiveness of cognitive rehabilitation programs applied after 2015 to individuals with Alzheimer's and MCI and to compile the examined findings.

Öz

Bilişsel rehabilitasyonun Alzheimer hastalığı ve hafif bilişsel bozukluk üzerindeki etkisine yönelik gözden geçirme

Günümüzde Alzheimer hastalığı (AH) ve hafif bilişsel bozukluk (HBB) dünya üzerinde sayısız bireyi etkileyerek en yaygın nörodejeneratif hastalıklar arasında yerini almaktadır. Alzheimer hastalığı bellek işlevlerinden dil işlevlerine kadar geniş bir yelpazede bilişsel işlevleri etkilemektedir ve hastalığın ilerlemesi ile bireyler üçüncü şahısların yardımına ihtiyaç duyabilmektedir. Hafif bilişsel bozulma, bireylerin bilişsel işlevlerinde gözlemlenen bozulmanın en erken evresi olarak tanımlanabilir. HBB'de birden fazla bilişsel alanda bozulmalar gözlemlenebilirken bireylerin günlük yaşamlarında bir miktar işlevsellik gösterebildikleri görülmektedir. Ayrıca Alzheimer hastalığı ve HBB beynin bazı bölgelerinde (parietal lob, frontal lob, temporal lob) dejenerasyona neden olur ve hastalık ilerledikçe, bazı beyin bölgelerinde büzölmeler meydana gelebilir. Bu nedenle, Alzheimer hastalığı ve HBB tanısı almış bireylerin günlük aktivitelerini geliştirmek adına bir dizi müdahale tekniği ortaya çıkmıştır. Bilişsel rehabilitasyon, günlük yaşam aktivitelerini iyileştirmeye odaklanan bireyselleştirilmiş bir süreçtir. Ayrıca bilişsel rehabilitasyonun etkinliği, Alzheimer hastalığı ve HBB'nin etkilediği bilişsel alanlarda çeşitli araştırmacılar tarafından ortaya konmuştur. Farklı araştırmacılar, farklı bilişsel rehabilitasyon programlarının bireylerin hayatlarının bilişsel, sosyal ve psikolojik alanlarını etkili bir şekilde geliştirdiğini ortaya koymuştur. Bu nedenle bu alanyazın taraması, 2015 yılından sonra Alzheimer hastası olan ve HBB'li bireylere uygulanan bilişsel rehabilitasyon programlarının etkinliğini incelemeyi ve incelenen bulguları derlemeyi amaçlamaktadır.

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In recent years, individuals' life expectancies have greatly increased. Therefore, precautions started to be taken against diseases, and individuals started to increase their living standards. Developments in technology and health have led to the development of measures against many diseases that caused death in previous years. Therefore, people can live longer today. However, for developing neurodegenerative diseases, long life is found to be a risk factor. Frontotemporal dementia (FTD) and Alzheimer's disease (AD) affect millions of individuals worldwide (Fratiglioni et al., 1999). In a review conducted in 2020, Breijyeh and Karaman (2020) suggested that there were 50 million individuals with AD worldwide in those years, and it is expected that this number will double every five years. Therefore, FTD and AD are the most common neurodegenerative diseases.

According to the American Psychiatric Association (1994), in early dementia, it is possible to observe disruptions in maintaining the personal care, social life, and working life of the individual while relatively reasonable judgment skills are still maintained. However, with these diseases, individuals may gradually lose their ability to maintain their daily lives on their own and may require the care of a family member as these diseases progress (Fratiglioni et al., 1999). Numerous abilities ranging from memory to language functions are affected by AD (Cotelli et al., 2019). On the other hand, FTD has a broader spectrum of neuropsychological impairments, including impairments in linguistic processing, executive functions, and social-cognitive abilities (Cotelli et al., 2019). Sometimes, the individual's inability to remember the most recent events may be one of the earliest symptoms of AD (Knopman et al., 2021). For this reason, in daily life, this disease has generally been characterized by forgetfulness.

On the other hand, Mild cognitive impairment (MCI) is the earliest stage in which symptoms appear (Knopman et al., 2021). While functional capacities are relatively preserved at this stage, at least mild impairment is observed in one or more of the cognitive domains (Knopman et al., 2021). Also, individuals with MCI are at risk of developing Alzheimer's disease as time progresses (Li et al., 2011). When the etiology of those diseases is examined, along with the genetic factors contributing to this disease, environmental risk factors including clinical depression, head injury, and high blood pressure accompany Alzheimer's disease (Knopman et al., 2021). Also, in the diagnosis process of those diseases, neuropsychological tests are used along with neurological examination and Magnetic Resonance Imaging techniques (Breijyeh and Karaman, 2020). Mild cognitive disorders can be revealed with detailed neuropsychological evaluations made up to 8 years before the individual fulfills the clinical criteria for Alzheimer's diagnosis (Bäckman et al., 2004).

When the neuropathology of Alzheimer's disease is examined, degenerative changes in the various neurotransmitter systems can be observed (Wenk, 2003).

While parietal lobe, frontal lobe, and temporal lobe degenerations can be seen, the death of synapses and neurons in the cerebral cortex characterize Alzheimer's disease (Wenk, 2003). Also, Alzheimer's disease-related disturbances are mostly correlated with the extent of prefrontal and medial temporal lobe atrophy, which includes the entorhinal cortex and hippocampus (Cappon et al., 2016). Moreover, with the MRI and PET neuroimaging techniques, it is proved that as the disease progresses from mild cognitive impairment to Alzheimer's disease, shrinkage of the specific brain regions is observed (Desikan et al., 2009).

When it is considered that it affects numerous individuals to a greater extent, prevention techniques are examined. However, no information has been found that any supplement or drug reduces the risk or prevents Alzheimer's (Hsu & Marshall, 2017). The inability to treat Alzheimer's has made it necessary to focus on intervention techniques that can be done to prevent its onset or slow down the process of development (Viña & Sanz-Ros, 2018). On the other hand, many studies have been done to improve activities of daily living, and it has been thought that some exercise programs can reduce the negative consequences of Alzheimer's (Forbes et al., 2015).

Several interventions are determined to prevent the symptoms of the diseases from getting worse. One of those interventions is cognitive rehabilitation. Cognitive rehabilitation includes a series of intervention methods formed by evidence-based methods to improve cognitive abilities (Cicerone et al., 2019). Cognitive rehabilitation offered by a trained therapist has proven its effectiveness in many problems that interrupt cognitive functions, from brain traumas to stroke (Cicerone et al., 2005). Although treatment of this disease is not possible, when sufficient environment, social support, and time are provided, individuals with dementia can maintain some knowledge and skills despite their memory problems (Bäckman, 1996).

Also, cognitive rehabilitation is an individualized process that focuses on the cognitive domain that needs to be improved to help the patient along with their families (Wilson, 2002). By determining ways to obtain important information, cognitive rehabilitation may help individuals with dementia by lessening their memory problems (Anderson et al., 2001). Also, it is known that withdrawing from society, friends, and family is frequently seen during Alzheimer's disease progression (Burns & Iliffe, 2009). Therefore, since cognitive rehabilitation focuses on individualized goals, to improve daily living activities it may improve individuals' social capabilities.

Between cognition-oriented therapies, reminiscence therapy and cognitive training are also highly popular (Amieva et al., 2016). Moreover, Amieva et al. (2016) highlighted that as a non-drug intervention, the firstly developed intervention that focuses on the improvements in the cognitive domains of individuals with dementia is cognitive training. While cognitive

training focuses on improving the memory, attention, and language domains, reminiscence therapy (which is the second most used method in dementia) generally focuses on improving the quality of life, self-esteem, and mood of the individuals (Amieva et al., 2016).

Also, the impact of cognitive training, which focuses on cognitive activities related to daily life has proven to be effective on mood and memory in individuals with early phases of dementia (Davis et al., 2001). To improve the specific function (usually memory, attention, and problem-solving abilities) cognitive training that is based on tasks designed to develop a specific cognitive function is used (Kim, 2015). However, in the cognitive rehabilitation process, several learning strategies, including dual-cognitive support and spaced retrieval are found to be efficacious in terms of enhancing the learning abilities of Alzheimer's disease patients (Clare et al., 2000; Farina et al., 2002).

Besides, major advances in technology facilitate cognitive interventions to promote a healthy lifestyle for people with MCI by adapting the traditional methods to technological forums (Irazoki et al., 2020). As a way of improving the cognitive functioning of people with MCI, computerized systems such as virtual reality tools, tablet software, and consoles for gaming are used (Ge et al., 2018). Zhang et al. (2019) indicated that cognitive training, strategies, and rehabilitation programs implemented through digital media channels indicate promising results in the cognitive functions of older individuals with MCI. Also, among the cognitive interventions, computerized ones are found to be useful for improving attention, memory, and cognition along with the psychological functioning of the elderly with MCI (Hill et al., 2017). However, Hu et al. (2019) stated that although computerized cognitive training is effective in improving the cognitive functions of the elderly, it is still a topic of research on which stages of cognitive impairment benefit the most from cognitive training.

Cognitive rehabilitation plans generally aim to improve the daily living activities, including psychopathological, behavioral status, and social relationships of individuals with Alzheimer's disease and mild cognitive impairment (Kasper et al., 2015). Also, the cognitive rehabilitation process generally focuses on increasing the daily functionality of individuals with Alzheimer's disease to increase their engagement in daily social activities (Wilson, 2002). Moreover, cognitive rehabilitation programs generally focus on the compensation process of the cognitive function rather than its restoration (Kasper et al., 2015). However, when its high cost is considered, Amieva et al. (2016) indicated that despite its effectiveness, cognitive rehabilitation is generally applied to young brain-injured individuals, not elderly individuals with dementia.

Furthermore, Kim (2015) emphasized that limited studies are present that examine the impact of cogni-

tive rehabilitation, other than pharmacological interventions, on the daily activities of elderly individuals with early-stage dementia. For this reason, more studies are needed to prove the effectiveness of cognitive rehabilitation methods that have a healing effect on individuals' daily activities for Alzheimer's disease, which does not yet have a possible treatment. Therefore, this literature review aims to guide further studies by examining the studies proving the effectiveness of cognitive rehabilitation on Alzheimer's disease and mild cognitive impairment. In addition, this literature review aims to reveal the developments in cognitive rehabilitation by examining the cognitive functions that cognitive rehabilitations have focused on in recent years and what kind of findings have been revealed.

Etiology and Epidemiology

Although the literature indicates that Alzheimer's disease etiology still includes uncertainties, it is thought that the etiology of the disease is composed of both non-genetic and genetic factors (Jiang et al., 2013). Jiang et al. (2013) also emphasize that while Amyloid precursor protein (APP) on chromosome 21, Presenilin 1 (PSEN1) on chromosome 14, and Presenilin 2 (PSEN2) on chromosome 1 single-gene mutations were found to be associated with early onset of Alzheimer's disease, environmentally determined factors accompany to these factors. These environmentally effective factors of Alzheimer's disease include exposures because of occupational necessities such as exposure to electromagnetic fields, already existing medical conditions such as hypertension, cerebrovascular diseases, diabetes, traumatic brain injuries, and unhealthy lifestyle factors like heavy smoking, lack of cognitive and physical exercise, and alcohol consumption (Jiang et al., 2013). Another point made by Jiang et al. (2013) is that intervention focusing on those non-genetic factors may lead to opportunities to prevent the progression of Alzheimer's disease. Therefore, there are both genetic and non-genetic factors that affect the incidence of Alzheimer's disease.

On the other hand, Bekris et al. (2010) indicate that the incidence of Alzheimer's disease (AD) exhibits a clear association with increasing age. The incidence of AD goes up from 2.8 cases per 1000 people between the ages of 65 and 69 to 56.1 cases per 1000 people over 90 years old (Bekris et al., 2010). Also, approximately 10% of individuals aged 70 years and older exhibit significant memory loss, with a probability of over 50% that such cases are attributable to AD. The prevalence of dementia among individuals aged 85 years and older is estimated to be between 25% to 45%, with the typical duration of the disease ranging from 8 to 10 years. However, it is worth noting that the length of the disease can vary greatly, ranging from 2 to 25 years following diagnosis (Bekris et al., 2010).

Furthermore, it is seen that Alzheimer's disease is

the most common etiology of MCI for individuals who are above 65 years old (Knopman & Petersen, 2014). Knopman and Petersen (2014) address that although its effects vary on MCI, cardiovascular diseases also play a role in the etiology of MCI. On the other hand, it is noted that both Lewy body disease, depression, multiple medical comorbidities, and frontotemporal degeneration can cause MCI (Knopman & Petersen, 2014). Likewise, Petersen (2016) concluded that vascular risk factors, degenerative diseases, major depression, and generalized anxiety disorder can be the cause of MCI and heart failure with no treatment, and uncontrolled diabetes and chronic obstructive lung disease can contribute to the MCI.

On the other hand, Petersen (2016) indicated that countless epidemiologic studies examined the prevalence of MCI, and the results concluded that the prevalence of MCI varies according to the different studies, mainly because of the different implementation criteria and variations in methodology. However, international studies generally estimate the prevalence of MCI to be within a range of 12% to 18% among individuals aged 60 years and older. Furthermore, the estimated overall prevalence of MCI among individuals aged 70 years and older has been established to be 16% (Petersen, 2016).

Current Treatment Perspectives

Although the treatment studies for Alzheimer's disease continue, there are various pharmacological and non-pharmacological treatment approaches take place in literature. Studies examining the effectiveness of treatment methods for Alzheimer's disease, which differ from person to person, are still ongoing (Keleş & Özalevli, 2018). Pharmacological treatment approaches for Alzheimer's disease generally focus on slowing down the progression of the disease and reducing the symptoms that affect individuals' lives (Keleş & Özalevli, 2018).

Atri (2019) indicates that pharmacological treatment medications mainly focus on reducing the individual's dependence on others, along with enhancing cognition. Several drugs have been approved for treating Alzheimer's disease, including aducanumab, donepezil, galantamine, rivastigmine, memantine, and a combination of donepezil and memantine (Pardo-Moreno et al., 2022). Cholinesterase inhibitors (ChEIs) and the N-methyl-D-aspartate (NMDA) antagonist memantine are the other approved medications used in the treatment of Alzheimer's disease (Atri, 2019). Also, to aid in the management of Alzheimer's disease, medical professionals administer Acetylcholinesterase inhibitors to boost cholinergic reserve alongside memantine (Büyükturan, 2014). However, Woods et al. (2005) emphasize that the usage of pharmacological treatment to eliminate behavioral symptoms may result in clinical problems like sedation and falling that affect the individual's quality of life.

Moreover, Keleş and Özalevli (2018) highlighted that depending on the existing symptoms, non-pharmacological treatments should be used.

When current non-pharmacological treatment approaches are examined, it is seen that the literature includes dance, massage, art therapy, music, and exercise (Keleş & Özalevli, 2018). Furthermore, Atri (2019) indicates that the current non-pharmacological treatment methods consist of educating patients on their condition, recognizing triggers, executing interventions, continuously assessing progress, and modifying behavioral and environmental strategies accordingly. Consistently, Pardo-Moreno et al. (2022) emphasize that non-pharmacological interventions for Alzheimer's disease also include improvements in physical activity, sleep patterns, diet, and complementary therapies (aromatherapy, music therapy) to improve patients' cognitive functions along with their quality of life.

Although the effectiveness of exercise for Alzheimer's patients is still debatable, Keleş and Özalevli (2018) highlighted that aerobic exercises like regular walking benefit the development of cognitive functions of patients with Alzheimer's disease. Also, it is reported that regardless of the onset and intensity of Alzheimer's disease, the attention, memory, and problem-solving functions of the patients benefit from exercise programs that can be offered both as individualized and group programs (Keleş & Özalevli, 2018). Furthermore, psychosocial treatment perspectives that focus on emotion, perception, behavior, and stimulation-oriented approaches in dementia are generally used to increase cognitive activity (Lök & Buldukoğlu, 2014).

Also, psychosocial interventions are used to aid pharmacological treatments (Lök & Buldukoğlu, 2014). Lök and Buldukoğlu (2014) emphasize that although more studies are needed on the effectiveness of behavioral interventions that focus the altering incompatible behaviors with compatible ones, it is thought that it may help dementia patients to function effectively in daily life. Besides, validation therapy, which focuses on expressing feelings, is a method that helps individuals approach dementia patients (Scanland & Emershaw, 1993). This therapy technique was developed for elderly dementia patients with cognitive impairment by Naomi Feil between 1963 and 1980 to communicate with disoriented individuals and elderly dementia patients via the usage of several interactive techniques (Bleathman, 1988). Also, it is stated that validation therapy can take place on a group or individual basis (Feil, 1992).

In validation therapy, exhibited behaviors of disoriented elderly are categorized as time confusion, misorientation, vegetation, and repetitive motion stages of disorientation (Feil, 1992). Thus, validation therapy uses 14 different techniques depending on the patient's needs (Lök & Buldukoğlu, 2014). These techniques include focusing, restating, polarizing, imagining the

opposite, observing the sense of mood and emotions of the individuals, contact, and usage of music (Lök & Buldukoğlu, 2014). Lök and Buldukoğlu (2014) also state that empathy is considered a milestone for this therapy technique, and it aims to increase individuals' happiness by reducing their stress levels. Similarly, Bleathman (1988) indicates that although these people's time orientation does not coincide with our reality, it is important to confirm and respect their emotions.

Moreover, validation therapy benefits the lives of individuals with dementia by reducing stress, restoring self-esteem, reducing physical tension, enhancing the perceived value of life, preventing social withdrawal, increasing verbal and nonverbal communication, and increasing the quality of life (Lök & Buldukoğlu, 2014). Furthermore, it is reported that validation therapy is used to prevent loneliness, stress, and anxiety in dementia patients (Lök & Buldukoğlu, 2014). Dementia patients who joined the validation therapy once a week for six months showed improvements in walking, eye contact, and behaviors (Sherman, 1993). Also, a study that examines the effectiveness of validation therapy in dementia patients found that it increases the quality of life by helping patients' physical health (Neal & Barton Wright, 2003).

Lök and Buldukoğlu (2014) also emphasize that reality orientation and cognitive retention therapy are other non-pharmacological treatment approaches to improve cognitive abilities in dementia patients. Reality orientation therapy helps individuals with dementia to gain person, place, and time orientation by including interventions like talking about family pictures, handcraft activities, and room arrangements (to help remember). On the other hand, it tries to re-increase the impaired mental capacity (Sherman, 1993; Vitiello & Borson, 2001). Moreover, cognitive retention therapy was found effective in slowing down the progression of dementia, improving cognitive symptoms, and increasing social functioning (Douglas et al., 2004).

Another non-pharmacological treatment approach is cognitive stimulation therapy, which is used in mild and moderate dementia patients to improve cognitive functions (Lök & Buldukoğlu, 2014). Also, studies showed that along with its improvements in memory, language, and comprehension functions, cognitive stimulation therapy has no side effects (Lök & Buldukoğlu, 2014). However, it is highlighted that although studies showed that interventions are effective in improving behavioral and cognitive aspects of the patient's life, complete treatment of Alzheimer's disease has not yet been achieved (Pardo-Moreno et al., 2022).

Cognitive Rehabilitation in Alzheimer's Disease

A cognitive rehabilitation study that includes cognitive training to increase the effectiveness of individuals with Alzheimer's disease (early stage) in their daily

living activities includes 43 individuals (15 men, 28 women) that meet the diagnostic criteria for Alzheimer's disease. After the Mini-Mental State Examination, random assignments of the individuals who scored 18 and above were done to the control or cognitive rehabilitation group (Kim, 2015). This cognitive rehabilitation used by Kim (2015) lasted for 8 weeks, and each week, individuals took cognitive rehabilitation for 30 minutes individually and 30 minutes as a group. In personalized cognitive intervention, individuals focus on meaningful personalized goals such as maintaining their attention, focusing on tasks, etc. These individual interventions consist of teaching the individual effective strategies to improve their functioning at their goals. On the other hand, Kim (2015) stated that sessions of cognitive interventions continued cognitive training focusing on practicing time and place orientation. For this goal, at the beginning of the session, individuals were aided from a personal memory notebook, calendar, or cellular phone. Also, it is noted that group sessions contained tasks related to matching faces and names along with tasks focused on sustaining attention and learning memory. To sum up, in this cognitive rehabilitation, individuals practiced sustaining attention, learning memory, face-name matching, and time/place orientation. Thus, compared to the control group, the group that underwent cognitive rehabilitation showed significant improvement in the practiced domains. Also, individuals who participated in cognitive rehabilitation scored higher than the controls in the Quality of Life for Alzheimer's disease after their participation (Kim, 2015).

Otherwise, in their research, Amieva et al. (2016) followed the individuals who participated in the study (Alzheimer's disease patients) following 3, 6, 12, 18, and 24 months after the start of non-drug therapy. Their study, which was conducted across France, included 653 patients with Alzheimer's disease. Only individuals who are in moderate or mild stages of the disease and 50 years and above are included in their study. Within the scope of this study, all participants were distributed to cognitive training, reminiscence therapy, and individualized cognitive rehabilitation programs in almost equal numbers. In this cognitive rehabilitation program of Amieva et al. (2016), the duration of weekly sessions of this intervention was 1 hour 30 minutes for three months, and maintenance sessions took place 21 months (every six weeks). A set of standard cognitive tasks involving memory, attention, language, and executive functions is included in this cognitive intervention. According to the individual's ability levels, one of the two levels of difficulty of the tasks is used, and groups containing five to eight individuals work on a specific standard task focusing on the activities of daily living. Along with those exercises with AD patients, simultaneously caregivers participate in separate sessions to get informed about the progression and symptoms of the disease (Amieva

et al., 2016). Also, reminiscence therapy sessions in this cognitive rehabilitation program focused on a specific personal theme (e.g., birthday, wedding, holiday) and caregivers participated by bringing materials like real-life photos in these weekly sessions. In the individualized sessions of this study by Amieva et al. (2016), patients participated in daily activities with their caregivers in the first two weeks according to their personal goals. Amieva et al. (2016) concluded that no improvement was observed in the participants who joined cognitive-oriented group therapies (reminiscence therapy and cognitive training). On the other hand, individualized cognitive rehabilitation results in significant improvement, and the institutionalization rates were lower after 24 months for the individuals who participated in the cognitive rehabilitation (Amieva et al., 2016).

Another study examined the computer-assessed cognitive rehabilitation effects on Alzheimer's disease patients' memories (Hwang et al., 2015). In the study the information related to computer use was given to the participants before they participated in the cognitive rehabilitation program. Cognitive rehabilitation was applied to Alzheimer's patients 5 days a week (half an hour every day) for 4 weeks. Both before and after, the cognitive state of the participants is evaluated by using the Cognitive Assessment Reference Diagnosis System and Mini-Mental State Examination-Korea Test. Also, this program included items related to simple recognition/spatial memory, sequential recall memory, and language categorization/integration/recall memory (Hwang et al., 2015). When the results are evaluated, it is observed that the scores of individuals who had cognitive training significantly increased the 10-word delayed list, 10-object delayed list, 10-object recognition, and recent memory domains on the Cognitive Assessment Reference Diagnosis System. However, a significant decrease in the domain of 10-word recognition is observed in the group that takes cognitive training. Otherwise, a considerable increase in the domains related to the registration, orientation, and recall of the Mini-Mental State Examination-Korea Test is observed. Thus, based on their study results, Hwang et al. (2015) concluded that the memory deterioration process can be delayed with computer-assessed cognitive rehabilitation.

Moreover, Germain et al. (2018) examined cognitive rehabilitation for Alzheimer's disease. The cognitive rehabilitation program consisted of one individualized session per week for three months, and cognitive rehabilitation sessions were carried out in individuals' home environments. In the cognitive rehabilitation program used, the areas where individuals have difficulties in their daily living activities were determined, and interventions were applied to improve these areas in daily life. In the cognitive rehabilitation program of Germain et al. (2018), firstly, identification of the difficulties in the patient's and their

relative's daily life was made. This assessment is made by the PROFINTEG research tool, which is designed to assess the performance level in daily life and the specific difficulties. As a second step, potentially rewarding activities are determined considering the patient's abilities to facilitate learning. For instance, as a developing memory aid, usage agenda and calendar use of technological devices are used. Lastly in their program, Germain et al. (2018) defined a program to adapt the selected activity to patients' lives by including the observation of this activity in their naturalistic environment. At the end of this cognitive rehabilitation, Germain et al. (2018) concluded that individuals who followed the program showed evolution in their functional abilities. It was also observed that there was a great improvement in the personally selected cognitive capacities of the participants. Since this study by Germain et al. (2018) included a follow-up evaluation of Alzheimer's disease patients after cognitive rehabilitation, it was observed that improvement in activities which are important for individuals' lives was preserved even after 1 year.

Furthermore, Santos et al. (2015) evaluated the effectiveness of multidisciplinary cognitive rehabilitation containing interventions on the quality of life, depression, and cognitive abilities of individuals who have mild to moderate Alzheimer's disease. The content of this multidisciplinary cognitive rehabilitation focused on memory practice, leisure pursuits, verbal and written expressiveness, physical treatment, and exercise. Also, in this program, 54 individuals who have mild Alzheimer's disease and 12 individuals who have moderate Alzheimer's disease participated in this cognitive training program for 12 weeks (6 hours per week). The intervention was applied in a group session containing 10 individuals at a day-hospital facility. The program included the following tasks for the patients: cognitive rehabilitation, computer-aided cognitive training, speech therapy, occupational therapy, art therapy, physical exercise, physical therapy, and cognitive stimulation involving reading and logical games. Also, each of these activities is provided every week for 60-90 minutes. Based on the results, Santos et al. (2015) concluded that significant improvements in cognition and life qualities are observed in mild Alzheimer's disease patients. Also, as a result of this cognitive rehabilitation, a meaningful decrease in the depression symptoms of mild Alzheimer's disease patients is observed compared to participants who are in the control group. However, no significant effect of cognitive rehabilitation is observed for individuals with moderate Alzheimer's disease (Santos et al., 2015).

Moreover, in recent years, Kurth et al. (2021) conducted a study investigating the cognitive rehabilitation program's effectiveness in patients with early Alzheimer's disease. They compared 17 individuals who are taking the usual treatment with 33 patients who joined the clinical cognitive rehabilitation program at

their homes along with their caregivers. The cognitive rehabilitation (CR) program comprised of one-hour individual sessions held weekly for three months at the patient's home, followed by monthly follow-up sessions for the subsequent nine months. They concluded that despite the decline in global cognition, the group that joined the cognitive rehabilitation program showed improvement in their daily activities. Also, Kurth et al. (2021) tested the caregivers' burden, and they found a significant decline in the burden of the caregivers' activities related to the daily chores at the end of this 12-month cognitive rehabilitation program.

Cognitive Rehabilitation in Mild Cognitive Impairment (MCI)

Regan et al. (2017) tested the effectiveness of cognitive rehabilitation on individuals who have mild cognitive impairment or early dementia (50 years and older). They included only individuals who scored 20 and above on the Mini-Mental State Examination. Cognitive rehabilitation programs, prepared by individuals in accordance with the personal goals they set before being included in the rehabilitation program, were provided to the participants in their own homes with one-hour sessions for 4 weeks. Results indicated that individualized cognitive rehabilitation is efficacious in improving goal performance along with the individual's satisfaction with mild cognitive impairment and early dementia.

Another study by Barekattain et al. (2016) investigated the effect of cognitive rehabilitation on nonamnestic types of mild cognitive impairment. In the cognitive rehabilitation program, patients with dementia were excluded according to the scores of the Mini-Mental State Examination and MCI diagnosis confirmed by the Neuropsychiatry Unit Cognitive Assessment (NUCog) tool which contains 5 cognitive domains including attention, language, visual-spatial, memory, and executive function. Widely accepted neuropsychological tests have been used to assess executive functions, including the Tower of London (TOL), which detects planning deficits; the Color Trial Test (CTT), which assesses divided and sustained attention; the Five Point Test, which assesses figural fluency function, divergent thinking, and the ability to change sets; the Go-No-Go Task, which assesses sustained attention; and the Category Fluency Test, which assesses self-monitoring along with working memory. The cognitive rehabilitation group is composed of individuals who agree on their problems regarding attention and executive functions. Therefore, in this study by Barekattain et al. (2016), individuals who have nonamnestic MCI joined the cognitive rehabilitation program that includes attention process training and problem-solving therapy for 8 weeks (2 hours a week) as a group. They concluded that the cognitive rehabilitation group showed significant improvements, espe-

cially in their executive functions (Barekattain et al., 2016).

Further, O'Sullivan et al. (2015) examine the individualized cognitive rehabilitation program, which consists of 5 individuals who have mild cognitive impairment. Cognitive rehabilitation strategies for MCI are categorized as relaxation restoration, psychoeducation, compensation, and environmental adaptation. Also, O'Sullivan et al. (2015) made their measurements before, after, and three months after the cognitive rehabilitation program with individuals who met the inclusion requirements, which included having self-reported memory concerns, objective memory deficits relative to their age that indicated a change in their cognitive function, demonstrating mostly normal performance in their everyday activities, and not having dementia. They focused their cognitive rehabilitation strategies mainly on face-name associations, personal diary, and relaxation along with memory, depression, and anxiety-related interventions. O'Sullivan et al. (2015) concluded that participants were successful in applying the practiced strategies in their daily lives and that depression/anxiety scores were significantly decreased through six to eight individualized cognitive rehabilitation sessions. Also, they found that while strategies to compensate for deficits in prospective and episodic memory showed the strongest effect, the findings have proven the effectiveness of cognitive rehabilitation on MCI.

On the other hand, Ge et al. (2018) conducted a meta-analysis to understand the effectiveness of cognitive-based interventions on the cognitive functions of individuals with MCI. Thus, they stated that some of the reviewed studies show that the global cognition of individuals with MCI is found to be significantly improved by computerized interventions. Also, some of the other reviewed studies in the scope of this meta-analysis found a discretely positive effect of computerized interventions on the attention, memory, and executive functions of individuals with MCI (Ge et al., 2018). Similarly, a meta-analysis examining 12 studies conducted with MCI patients revealed that cognitive rehabilitation programs using computerized cognitive training significantly improved the cognitive functions of individuals with MCI (Hu et al., 2019).

DISCUSSION

Considering the increasing number of individuals diagnosed with Alzheimer's disease and MCI and their impact on the individual's daily life, cognitive rehabilitation aimed at improving the areas of focus is gaining importance. Thus, this literature review is established to share information about preventive and therapeutic cognitive rehabilitation for Alzheimer's disease and mild cognitive impairment.

According to research in literature, cognitive rehabilitation slows the loss of cognitive abilities in people

with Alzheimer's and MCI diagnoses and promotes gains in the areas where loss has occurred. In many studies, it is observed that control groups that were not included in the cognitive rehabilitation program showed higher deterioration in the focused cognitive domains. On the other hand, it is mainly observed that individuals with Alzheimer's disease/MCI show improvements, and some of the studies concluded that these improvements are seen to be preserved months after cognitive rehabilitation.

Determining the deficiencies and weaknesses of the examined studies is mainly important to determine a way for the planned interventions in future studies. Thus, the strengths and weaknesses of some of the studies are examined. Santos et al. (2015) concluded that while individuals with mild Alzheimer's disease benefitted from cognitive rehabilitation, no improvement was observed for individuals with moderate Alzheimer's disease. Thus, this finding points out that according to the level of deterioration, the effectiveness of cognitive rehabilitation may vary. However, in this study, the number of participants who have moderate Alzheimer's disease was remarkably lower compared to the individuals with mild Alzheimer's disease. Therefore, the uneven distribution in the number of people can overshadow the generalizability of the results.

In addition, although it is known that cognitive rehabilitation programs are quite costly, it has been proven that compared to cognitive training programs or reminiscence therapy, cognitive rehabilitation is determined to be the most effective intervention technique (Amieva et al., 2016). Also, with the developments in technology, cognitive rehabilitation programs could be supported by computerized interventions. Therefore, studies showed that computer-assessed cognitive rehabilitation is also effective in ameliorating the functionality of individuals with Alzheimer's disease (Hwang et al., 2015).

Thus, these findings prove that technological improvements may also be beneficial in terms of the effectiveness of cognitive therapies. In addition, future studies may investigate the effectiveness of cognitive rehabilitation programs that can only be applied over the computer. Therefore, the cognitive rehabilitation program provided through the computer can help these programs reach more individuals by reducing costs.

On the other hand, it is seen that most of the discussed articles are mainly composed of female participants. Although none of the articles addresses any gender differences in the effectiveness of cognitive rehabilitation programs, further studies should include equal numbers of females/males in their studies to see whether any gender benefitted more from the cognitive rehabilitation programs. Also, most of the studies focus only on individuals with Alzheimer's disease. However, as family members are often the caregivers of individuals with Alzheimer's disease or MCI, it is highly likely that assessing the psychological state of

these family members is equally important. Therefore, future studies may include individuals with Alzheimer's disease or MCI and their family members together in the cognitive rehabilitation program to see whether the rehabilitation process is beneficial for family members as well.

Furthermore, the study of Amieva et al. (2016) differed from the other studies in terms of the number of people included in the study and the follow-up of the participants over a long period. Their study included 653 patients with Alzheimer's disease, and they followed the participants several times within 24 months. Because this study follows participants even after 2 years, it highlights the long-term effects of cognitive rehabilitation. At the same time, Santos et al. (2015) examined the effectiveness of multidisciplinary cognitive rehabilitation programs and proved their effectiveness. Although the effectiveness of different cognitive rehabilitation programs has been proven, this study is strong, especially because it focuses on improving various functions.

Furthermore, Amieva et al. (2016) concluded that compared to the group therapies, the individually applied intervention methods for Alzheimer's disease are the most effective ones. Thus, by including a piece of new information, every study individually contributed to cognitive rehabilitation literature for Alzheimer's disease and MCI. However, most of the studies were only focused on individuals who have mild impairment. For future studies, including individuals with moderate impairment could be beneficial for addressing the effectiveness of cognitive rehabilitation programs for different levels of impairment.

Conclusions

In conclusion, over the years, numerous studies have examined the effectiveness of cognitive rehabilitation on different cognition-related problems. Alzheimer's disease and MCI are growing common problems in all countries due to the number of people they affect and their negative effects that prevent individuals from functioning effectively in life. Therefore, since there is no complete treatment for those diseases is possible, the importance of non-drug interventions is highly increased. Thus, different cognitive rehabilitation programs prove their effectiveness for numerous individuals with Alzheimer's disease and MCI from different countries.

DECLARATIONS

Ethics Committee Approval N/A

Conflict of Interest All authors of this article declare that there is no conflict of interest related to the article.

Informed Consent N/A

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