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## Evidence-Based Decisions: Memory Intervention for Individuals With Mild Cognitive Impairment

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## Structured Abstract

**Clinical Question:** Do individuals with mild cognitive impairment (MCI) benefit from memory strategies/supports training versus no training, based on their performance on prospective memory tasks?

**Method:** Systematic Review

**Sources:** PSYCINFO®, CINAHL®, PubMed®, and ASHA® journal search

**Search Terms:** MCI, cognitive rehabilitation, cognitive intervention, speech-language pathology, AND cognitive training.

**Number of Studies Included:** 5

**Total Number of Participants:** *N* = 171

**Primary Results:** Typically aging adults and individuals with MCI who received memory strategies/supports training showed improved memory skills for activities of daily living (ADLs), recall, and use of compensatory strategies during post-test and follow-up testing compared to individuals who received no training.

**Conclusions:** A number of studies support the use of memory strategies/supports for individuals with MCI. Several studies have demonstrated that individuals with MCI who receive training on strategies/supports to increase memory ability show significant functional gains on completion of ADLs, memory recall tasks, everyday memory tasks such as learning new names, and knowledge and use of memory strategies at post-testing. In one study, individuals perceived significant gains in their own memory performance following memory strategy training. Some studies revealed that functional gains were maintained at follow-up testing. Clinicians who treat individuals with MCI should consider a systematic approach to teaching and implementing memory strategies/supports with their clients.

# Evidence-Based Decisions: Memory Intervention for Individuals With Mild Cognitive Impairment

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## Clinical Scenario

Anna is a new speech-language pathologist (SLP) who works with elderly adults in an inpatient skilled nursing facility (SNF). During the course of her evaluations, she often has individuals tell her that they cannot remember information like they used to. One individual recently shared that she feels she no longer has a good memory; she has "a good forgettery." Anna has limited time to complete a cognitive screening or evaluation when she assesses her clients and she is concerned about properly identifying and treating individuals with mild cognitive impairment (MCI).

Based on her graduate coursework notes and assigned readings regarding characteristics of normal aging, Anna knows that the typical aging process does not always result in memory impairment or decreased cognitive function. During a clinical externship at a long-term care facility as a graduate student, Anna worked with many residents diagnosed with some form of dementia. This experience instilled in Anna a desire to help older individuals maintain their cognitive functioning for as long as possible to reduce the amount of time spent in long-term care facilities. She had recently read an article in the *ASHA Leader* that discussed the possibility of early detection of Alzheimer's disease and new criteria for the diagnosis of mild cognitive impairment (MCI; Schreck, 2012). Though the article reviewed diagnostic criteria, assessment, and screening for cognitive impairments, it did not address treatment for MCI. In addition to reviewing current evidence-based research on reliable cognitive screenings and effective treatment for MCI, Anna consulted other SLPs working with elderly patients in SNFs about treatment approaches.

In discussing MCI treatments with colleagues, Anna received mixed opinions about the type of intervention she should provide. Some of her colleagues believed that SLPs could not provide effective intervention for individuals with MCI, so they did not provide intervention services to individuals with MCI. Some colleagues stated that they encouraged individuals with MCI to engage in brain stimulating activities such as crossword puzzles, Sudoku games, or computerized "brain games." Other colleagues encouraged Anna to utilize memory strategy training in her sessions. There was not a consensus among her colleagues, regarding the best course of action. Because Anna is a new SLP and wants to provide evidence-based interventions, she decided to review the literature on review on behavioral interventions for MCI.

## Background

Mild cognitive impairment (MCI) refers to aging individuals who exhibit cognitive deficits that are not severe enough to be considered dementia, but negatively affect cognition (Huckans et al., 2013; Petersen, 2004). The U.S. Department of Health and Human Services reports that nearly 21% of the U.S. population will be older adults by 2040 (A Profile of Older Americans, 2012). The Alzheimer's Association also estimates that the prevalence of Alzheimer's disease will triple by 2050; approximately 13.8 million Americans could be diagnosed with Alzheimer's disease (*Alzheimer's Disease Facts and Figures,* 2013). Anna believes that the prevention of MCI or maintenance of MCI before the onset of dementia could improve quality of life for elderly individuals and possibly decrease the amount of time elderly individuals reside in long-term care facilities.

Early intervention for individuals with MCI can help them maintain or potentially increase their cognitive functions. Intervention is not a cure for avoiding dementia, but it can help improve and stabilize cognitive function, performance of daily activities, behavior, mood, and quality of life (*Alzheimer's Disease Facts and Figures,* 2013). Clinicians need to have a firm understanding of the theoretical basis and terminology used by researchers

within the speech-language pathology and neuropsychology literature to make informed decisions about cognitive intervention programs.

## Theoretical Model

The theoretical model proposed by Huckans et al. (2013) provides a conceptual framework to inform development and implementation of cognitive rehabilitation programs. This model defines the differences between healthy age-related cognitive decline, MCI, and dementia. The authors propose that three types of symptoms characterize MCI:

—Mild cognitive compromise as measured by objective neuropsychological tests

—Mild functional compromise as measured by daily functioning and perceived quality of life

—Commonly associated neuropsychiatric issues such as depression, fatigue, and sleep difficulties

Huckans et al. (2013) suggest that understanding the symptoms of MCI assists professionals in providing treatments that will enhance an individual's overall daily functioning and quality of life. Because their model defines MCI as the stage between healthy age-related cognitive decline and dementia, there are a number of possible intervention targets. The three symptoms of MCI could be targeted individually or grouped together. To address mild cognitive compromise (first symptom type), restorative cognitive training is used to improve or return cognitive abilities to their prior level of functioning. Restorative cognitive training utilizes structured and repeated practice of specific tasks or exercises (e.g., recalling names of common objects used during daily routines). To address functional compromise (second symptom type), compensatory cognitive training is used. Compensatory cognitive training teaches strategies or skills that can be used to compensate for functional cognitive deficits (e.g., using an association strategy to recall items on a grocery list). To address neuropsychiatric issues (third symptom type), traditional psychotherapy techniques are used, such as relaxation exercises and stress management strategies.

## Clinical Question

Anna used the PICO framework, which is frequently used for making evidence-based decisions (e.g., Richardson, Wilson, Nishikawa, & Hayward, 1995; Sackett, Strauss, Richardson, Rosenberg, & Haynes, 2000), to develop her research question:

*Do individuals with MCI* (Patient/Patient Group/Problem) who benefit from memory strategies/supports training (Intervention) compared to individuals with MCI who do not receive training (Comparison treatment) demonstrate improved memory function (Outcome)?

## Search for Evidence

### *Retrieval Strategy*

Anna was able to use her university library and its electronic databases to research articles to include in her review. In addition to the journals of the American Speech-Language-Hearing Association (ASHA®), Anna searched three major electronic databases (PSYINFO®, CINAHL®, and PubMed®). She used search terms from Huckans et al. (2013) and Hopper et al. (2013): MCI, cognitive rehabilitation, cognitive intervention, speech-language pathology, and cognitive training. Anna limited her search to studies published in the English language and she identified more than 300 articles using the key terms. She scanned titles and abstracts to eliminate articles that did not meet her inclusion criteria. After carefully considering twelve articles, Anna retained five for her review of memory strategies/supports for individuals with MCI. She eliminated seven articles because they primarily focused on outcomes related to pharmacological treatments or lifestyle interventions.

### *Inclusion Criteria*

Anna chose to include only randomized control group design studies that evaluated the effects of an intervention using pre- and post-testing. She excluded articles that did not report outcomes at both points during the study. Anna wanted to find studies that specifically provided intervention to participants with MCI, so she included only studies that differentiated individuals with MCI from those with dementia (rather than grouping them together).

### *Exclusion Criteria*

Based on her PICO question, Anna excluded articles that primarily focused on neuroimaging results and/or were based on pharmacological treatments or lifestyle interventions (e.g., exercise, diet restrictions, sleep habits)

because she was unable to replicate those types of treatments within the SNF setting. She excluded behavioral interventions that did not address memory impairments.

## Evaluating the Evidence

Anna used the Oxford Center for Evidence-Based Medicine 2011 Levels of Evidence (OCEBM Levels of Evidence Working Group, 2011) to evaluate the studies she found. The most scientifically robust studies (i.e., systematic reviews of randomized trials) are rated a 1, and the least robust (i.e., mechanism-based reasoning) are rated a 5. A summary of the studies Anna included in the review are listed in Table 1. The table provides a short description of each study including the research design and type and description of cognitive intervention used. All of the studies Anna selected were randomized control trials. According to the OCEBM Levels of Evidence, the studies Anna selected are rated at level 2 due to the scientifically robust nature of randomized control trials.

One of the selected studies focused specifically on a restorative cognitive training intervention. Hampstead et al. (2012) evaluated the use of mnemonic strategy training in healthy elderly individuals and persons with MCI. A total of 49 participants, 21 healthy controls and 28 individuals with MCI, were randomly assigned to an exposure or a mnemonic strategy group. The participants completed five individual sessions within a 2-week period and returned after 1 month for a follow-up session. Nine pictured rooms, each containing five different locations (e.g., cabinet, shelf, floor), were used as the stimuli material. Two sets of 45 household objects were assigned to a specific location within a particular room (five objects per room). A total of 90 object–location associations (OLAs) were presented. Participants in the exposure group were shown each OLA and later asked to match it to a specific room/location without the use of a mnemonic strategy. Individuals in the mnemonic strategy group were provided specific cues for each OLA. The mnemonic strategy was introduced using a visual and verbal association. The researcher provided a reason that linked the object to a feature within a specific location (e.g., object: ring; feature: sinks; location: bathroom; reason: When washing dirty hands, place the ring on the counter between the two sinks in the bathroom so that it will not accidentally slip into the drain). The participant was then encouraged to create a mental image that incorporated the object, feature, location, and reason. Later, participants were asked to match the object and location. The results of the study demonstrated that mnemonic strategies were more effective than matched exposure for remembering the information for persons with and without MCI. The researchers also found that the benefits of using mnemonic strategies persisted after 1 month of training.

Another selected article focused specifically on compensatory cognitive training intervention. Greenaway et al. (2012) used a memory support system that included calendars and notebooks. A total of 37 participants with amnestic MCI (aMCI), a subtype of MCI characterized by memory decline without functional impairments, were randomly assigned to a treatment or no-treatment group. The participants completed the study with a program partner (typically a spouse or caregiver). Individuals in the no-treatment group were asked to begin using the calendar at home, but did not receive any direct intervention. Participants in the treatment group attended the training in dyads (participant with aMCI and his/her program partner). They received explicit instruction 2 hours per week for 6 weeks on using a calendar and notebook to track appointments, "to do" items, and journaling important information. This training program was designed specifically to teach compensatory strategies and did not aim to improve memory skills. The results of the study demonstrated that the treatment group significantly improved daily functioning. Improvement was measured with the *Everyday Cognition* (ECog; Farias et al., 2008), an informant-based measure of activities of daily living completed by the program partners. The improvements in daily functioning, such as memory, planning, and organization, were reported up to 8 weeks post-intervention.

Two of the selected articles targeted memory using a combination of restorative cognitive training intervention and compensatory cognitive training intervention. Rapp, Brenes, and March (2002) employed a multi-faceted intervention program. A total of 19 participants with MCI were included in the study—9 in the treatment group and 10 in the no-treatment group. Persons in the treatment group participated in six weekly 2-hour group meetings. Topics covered in the weekly meetings included factors that can influence memory performance (e.g., fatigue and motivation) and relaxation exercises. Training for specific memory skills (e.g., cueing, categorization, chunking) also was provided. The participants in the

treatment group were assigned homework tasks to practice the trained skills. The participants in the no-treatment group did not receive any memory education or training. Following participation in the intervention program, members of the treatment group perceived themselves as having significantly better memory abilities; however, increases for immediate and delayed word list and paragraph recall were not statistically significant.

A total of 42 participants with MCI were included in the Troyer, Murphy, Anderson, Moscovitch, and Craik (2008) study. The study aimed to change everyday memory behavior in persons with aMCI via a combination of restorative and compensatory cognitive training intervention. The participants were randomly assigned to the intervention ($n$ = 19) or wait-list ($n$ = 23) group. The intervention group received ten 2-hour sessions over the course of 6 months. The intervention was provided during group sessions that consisted of information about lifestyle, memory intervention training, and outcome testing. Participants in the intervention group were given at-home assignments to practice the skills taught during the session. Participants in the wait-list group did not receive treatment during the experiment; however, they were offered the opportunity to participate in the intervention program following post-testing. The results of the study indicated that individuals with aMCI in the intervention group demonstrated significantly better knowledge and use of memory strategies (per three measures of memory-strategy knowledge: strategy toolbox questionnaire, strategy use at home, and strategy use on memory tasks). The participants maintained their improved functioning up to 3 months post-intervention.

The final study Anna selected used a lifestyle, compensatory cognitive-training intervention and a neuropsychiatric approach to early intervention in individuals with aMCI. Kinsella and colleagues (2009) examined 44 individuals with aMCI. Their family members were also asked to participate. The intervention group consisted of 22 individuals with aMCI and 24 family members. The wait-list group consisted of 22 individuals with aMCI and 14 family members. Participants in the intervention group met for five weekly 90-minute group sessions. Sessions included instruction on a problem-solving approach to everyday memory problems, strategies for improving organizational and attention skills, specific memory strategies, and general coping strategies. Individuals who were randomly assigned to the wait-list group were given the opportunity to participate in an intervention program at the completion of the study. The results of the study showed significant gains in the treatment group for actual performance of everyday memory tasks as measured by prospective memory tasks (i.e., reminding task, envelope task) and the self-reporting *Multifactorial Metamemory Questionnaire–Ability* subscale (Troyer & Rich, 2002). The changes in performance were sustained for up to 3 months post-intervention.

In summary, Anna selected five Level 2 studies that used a randomized control group design. Table 2 provides a brief summary of the results, outcome measures used, and statistical findings for each study. Each of the studies targeted memory function in an effort to improve or maintain current cognitive functioning. Three of the studies were randomized control trials that reported statistically significant results. The other two studies were also randomized control trials but did not report statistically significant results for primary outcomes.

Though the specific approach for targeting memory skills varied across studies, all studies resulted in positive changes in memory (objectively measured and/or reported) for individuals with MCI.

## The Evidence-Based Decision

After searching and reviewing numerous peer-reviewed journal articles, Anna selected five articles to include in her review of memory interventions for individuals with MCI. Using the theoretical model presented by Huckans et al. (2013), Anna categorized the type of memory intervention provided in each study. She reviewed studies that provided a single intervention as well as studies that used a multi-faceted approach to memory.

Anna decided after reviewing the literature that individuals with MCI benefit from explicit training for memory strategies and/or supports. The peer-reviewed, randomized control trial studies she found provided evidence-based treatments for memory impairments. She determined that individuals with MCI who did not receive training on memory strategies and/or supports would not perform as well as individuals with MCI who did.

Anna is confident that she can provide individual or group services to individuals with MCI. Her education in the field of speech-language pathology has provided her with the knowledge foundation for teaching individuals

how to effectively use memory strategies and/or supports. Using the information she obtained during her review of the literature, Anna hopes to start a memory-training program in the SNF for individuals who are identified with MCI or healthy individuals who are interested in maintaining cognitive function. She believes that early intervention for MCI is critical for helping individuals maintain cognitive functioning as long as possible.

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*Table 1. Research Design, Type of Cognitive Intervention, and Descriptions of Included Studies*

| Study | Research Design/ Evidence Level | Type of Cognitive Intervention | Participants (*n*) | Description of Control Group Condition | Description of Experimental Group Intervention | Experimental Group: Frequency of Intervention | Similarity at Baseline/ Pre-Testing |
|---|---|---|---|---|---|---|---|
| Hampstead, Sathian, Phillips, Amaraneni, Delaune, & Stinger (2012) | Randomized Control Trial/Level 2 | Compensatory Cognitive Training Intervention–Memory | 28 adults with aMCI, (14 treatment group, 14 no-treatment group) and 21 adults in control group | Matched-exposure for object–location associations (OLA) | Mnemonic strategy training for OLAs | 5 sessions, 60–90 minutes x 2 weeks | Means and *SD* reported for key measurements at pre- and post-testing |
| Greenaway, Duncan, & Smith (2013) | Randomized Control Trial/Level 2 | Compensatory Cognitive Training Intervention–Memory | 37 adults with aMCI (18 treatment group, 19 no-treatment group) and program partners | Calendar provision | Calendar provisions plus Memory Support System training for appointments, to do lists, and journaling | 12 sessions, 60 minutes x 6 weeks | Means and *SD* reported for key measurements at pre-testing, 8-week follow-up, and 6-month follow-up |
| Kinsella, Mullay, Rand, Ong, Burton, Price, Phillips, & Storey (2009) | Randomized Control Trial/Level 2 | Comprehensive Interventions–Multimodal | 44 adults with aMCI (22 treatment group, 22 no-treatment group) | Wait-list control | Training in compensatory memory strategies and external memory aids; training in strategies to improve organizational and attention skills in approaching learning and remembering; discussion of coping strategies; education about lifestyle strategies including physical exercise and cognitive activities | 5 sessions, 90 minutes x 5 weeks | Means and *SD* reported for key measurements at pre- and post-testing |
| Rapp, Brenes, & Marsh (2002) | Randomized Control Trial/Level 2 | Comprehensive Interventions–Memory | 19 adults with MCI (9 treatment group, 10 no-treatment group) | No treatment | Education about memory loss, relaxation training, compensatory memory strategy training, and cognitive restructuring for memory-related beliefs | 6 sessions, 120 minutes x 6 weeks | Means and *SD* reported for key measurements at pre- and post-testing |
| Troyer, Murphy, Anderson, Moscovitch, & Craik (2008) | Randomized Control Trial/Level 2 | Comprehensive Interventions–Memory | 42 adults with aMCI (19 treatment group, 23 no-treatment group) | Wait-list control | Compensatory memory strategies in attention: intensive lifestyle education including relaxation and stress management skills, nutrition skills, and community resources; importance of recreational activities, physical exercise, and cognitive activities | 10 sessions, 120 minutes x 26 weeks | Means and *SD* reported for key measurements at pre- and post-testing |

*Table 2. Summary of Study Results, Outcome Measures, and Statistical Findings*

| Study | Hampstead, Sathian, Phillips, Amaraneni, Delaune, & Stringer (2012) | Greenaway, Duncan, & Smith (2013) | Kinsella, Mullay, Rand, Ong, Burton, Price, Phillips, & Storey (2009) | Rapp, Brenes, & Marsh (2002) | Troyer, Murphy, Anderson, Moscovitch, & Craik (2008) |
|---|---|---|---|---|---|
| Summary of Results | Mnemonic strategy training improved ability to recall object-location associations in healthy controls and aMCI participants. | Memory support systems were found to improve functional ability in activities of daily living. | Participants in the intervention group demonstrated improved performance on everyday memory tasks and on knowledge and use of memory strategies. | Following completion of the memory training program, participants in the treatment group perceived themselves to have significantly improved memory abilities. | Memory strategy knowledge and use increased significantly in the treatment group at post-test and 3-month follow-up. |
| Outcome Measures | 1. MMSE<br>2. RBANS<br>3. Trail Making Test<br>4. GDS<br>5. FAQ | 1. DRS-2<br>2. MMSE<br>3. eCOG<br>4. QOL-AD<br>5. CES-D<br>6. Caregiver burden<br>7. Caregiver mood<br>8. Memory self-efficacy | 1. Prospective memory tasks<br>2. MMQ-perceived memory ability<br>3. Contentment associated with memory<br>4. Memory strategy usage<br>5. SKR–memory strategy knowledge | 1. Word list task<br>2. Grocery list memory task<br>3. Names and faces memory task<br>4. Perceived memory ability–MCI and MFQ<br>5. Perceived control over memory–MCI<br>6. Use of memory strategies– MFQ<br>7. Perceived impact of memory problems–MFQ | 1. Memory strategy use–MMQ<br>2. Memory task<br>3. Memory strategy knowledge<br>4. Self-reported memory ability–MMQ<br>5. Memory contentment–MMQ<br>6. Perceived impact of memory on daily functioning<br>7. Perceived importance of lifestyle factor's impact on memory<br>8. Face–name learning<br>9. Number learning<br>10. Word list learning |
| Statistical Findings | In the mnemonic strategy group (healthy controls & aMCI), a positive correlation was found between immediate improvement and RBANS scores (.68; $p < .001$). For the aMCI mnemonic group, a positive correlation was found for the Trail Making Test. | The intervention group demonstrated significant improvement according to the eCog at the end of training ($t(15) = 3.1$, $p < 0.01$) and 8-week follow-up ($t(17) = 2.4$, $p < 0.05$). | A significant group effect ($F(1, 36) = 5.98$, $p = 0.02$) was found on prospective memory tasks at 2 weeks and 4 months follow-up such that the treatment group performed significantly better than the no-treatment group. | Perception of memory ability by the treatment group was significantly greater than the non-treatment group as measured by the MCI ($p = 0.008$, $R2 = 0.23$) | A significant main effect was found across the strategy use tests ($F(3, 43) = 6.97$, $p = 0.001$) and with each test individually. Strategy toolbox ($F(1,45) = 14.27$, $MSE = 178.93$, $p < .001$); MMQ–strategy ($F(1,45) = 5.74$, $MSE = 168.62$, $p = 0.021$); Strategy use on memory tasks ($F(1, 45) = 4.08$, $MSE = 12.61$, $p = 0.049$) |
| Follow-up | 1 month | 6 months | 4 months | N/A | 3 months |

CES-D = Centers for Epidemiological Studies - Depression; DRS-2 = Dementia Rating Scale-2; eCOG = Everyday Cognition; FAQ = Functional Activities Questionnaire; GDS = Geriatric Depression Scale; MCI = Memory Controllability Index; MFQ = Memory Functioning Questionnaire; MMQ = Multifactorial Metamemory Questionnaire; MMSE = Mini-Mental Status Exam; QOL-AD = Quality of Life-Alzheimer's Disease; RBANS = Repeatable Battery for the Assessment of Neuropsychological Status; SKR = Strategy Knowledge Recall