Summer 1-1-2016

Group External Memory Aid Treatment for Mild Cognitive Impairment

Alyssa Lanzi

GROUP EXTERNAL MEMORY AID TREATMENT FOR

MILD COGNITIVE IMPAIRMENT

A Thesis

Submitted to the John G. Rangos Sr. School of Health Sciences

Duquesne University

In partial fulfillment of the requirements for

the degree of Master of Science

By

Alyssa M. Lanzi

August 2016

GROUP EXTERNAL MEMORY AID TREATMENT FOR

MILD COGNITIVE IMPAIRMENT

By

Alyssa M. Lanzi

Approved June 13, 2016

_____
Sarah E. Wallace, Ph.D.
Associate Professor of Speech-Language
Pathology
(Committee Chair)

_____
Diane L. Williams, Ph.D.
Associate Professor of Speech-Language
Pathology
(Committee Member)

_____
Caterina F. Staltari, M.A.
Clinical Director of Speech-Language
Pathology
(Committee Member)

_____
Gregory H. Frazer, Ph.D
Dean, John G. Rangos School of Health
Sciences

_____
Mikael D.Z. Kimelman, Ph.D.
Chair, Speech-Language Pathology
Associate Professor of Speech-Language
Pathology

ABSTRACT

GROUP EXTERNAL MEMORY AID TREATMENT FOR MILD COGNITIVE

IMPAIRMENT

By

Alyssa M. Lanzi

August 2016

Thesis supervised by Sarah E. Wallace, Ph.D.

Short-term memory deficits associated with mild cognitive impairment (MCI) make complex daily activities challenging. External memory aids (EMA) could help compensate for impairments. The study purpose was to examine the effects of group EMA treatment for individuals with MCI on functional EMA use, cognitive abilities, maintenance of skills, and EMA preference. Six participants (divided into wait-list control and treatment groups) completed six weekly group treatment sessions. Post-treatment participants slightly increased or maintained functional EMA use and cognitive abilities. Mixed results related to maintenance of skills indicated the importance of treatment to reinforce EMA use. Clinical implications and research directions will be discussed.

ACKNOWLEDGMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Introduction

Mild Cognitive Impairment

Over eight million Americans are currently living with mild cognitive impairment (MCI), yet limited evidence exists to guide clinicians working with these individuals (Panza et al., 2005). People with MCI experience changes in memory that are greater than expected due to normal aging, but their cognitive abilities exceed those of individuals with dementia (Peterson, 2004). About half of the individuals diagnosed with MCI eventually progress to dementia (Doty, 2007). Even individuals who do not progress to dementia may continue to experience diminished memory abilities for the remainder of their lives. Although people with MCI often live independently, their social relationships and ability to complete complex daily activities with the same speed and efficiency are greatly affected. Individuals with MCI may have impairments across all cognitive domains; however, short-term memory deficits are often the primary feature (Constantiniduo, Wertheimer, Tsanadis, Evans & Paul, 2012; Doty, 2007).

External Memory Aids

One common strategy used to compensate for memory deficits is the use of external aids (Gillespie, Best, & O'Neill, 2012). Many types of external memory aids (EMAs) exist including weekly planners, written schedules, log books, calendars, timers, alarms, and other electronic devices (Bourgeois, 2013; Garrett & Yorkston, 1997; Hersch & Treadgold, 1994; Sohlberg & Mateer, 2001). When provided with appropriate instruction, EMAs allow people with memory impairments to compensate for their impairments in daily activities (Sohlberg & Mateer, 2001). Individuals may rely on relatively intact procedural memory skills to learn how to use an EMA. Early instruction in external aids is likely beneficial for people with a MCI, because during this

1

early stage their procedural memory is relatively intact enhancing the opportunity to learn a new skill (Constantinidou et al., 2012).

Regardless of the type or pattern of progression experienced by people with MCI, they are likely to benefit from the use of EMAs. For individuals who continue to display characteristics of MCI without progression to dementia, using external aids may increase their successful participation in complex daily activities. Clare et al. (2003) found that individuals with an initial diagnosis of MCI, who progress to dementia, will likely benefit from early instruction in compensatory strategies before they experience further cognitive decline (as cited in Kinsella et al., 2009).

Preferences for External Memory Aids

Limited evidence exists regarding the preferences of people with MCI related to EMAs. However, general consideration of individual preferences towards EMAs and assessments used with populations who presented with similar cognitive impairments may provide some insight. An EMA cannot be forced upon an individual with a cognitive impairment (Scherer, 2005). For an EMA to be successful, a holistic view of the individual is necessary. A holistic view includes considering, the individual's goals, preferences, and environment prior to choosing an EMA (Scherer, 2005). Scherer (2005) found that EMAs are most effective when each person's functional and social needs are considered, rather than choosing an EMA solely based on the diagnosis. For example, using an organizational EMA (e.g., pill organizer) may not be appropriate for someone who is already accustomed to having a nurse sort and provide morning and evening pills. Therefore, when selecting an EMA, clinicians should consider multiple variables including the person's preferences.

Limited research exists on the preferences of individuals with MCI regarding electronic EMAs. Therefore, it is important to examine the traumatic brain injury (TBI) research, because individuals with both etiologies demonstrate short term memory deficits with relatively intact procedural memory skills. (Cicerone et al., 2000; Constantinidou et al., 2012). Most of this research focuses on the use of electronic EMAs. Research has also shown the importance of using high-technology aids with 80 individuals who have a TBI (Hart, Buchhofer, & Vaccaro, 2004). Specifically, researcher found that individuals with TBI have a relatively high interest and comfort in learning new types of EMAs (Hart et al., 2004). The researcher also found that 32% of participants reported using electronic aids in their daily life. Due to the high level of interest and comfort with electronic EMAs, individuals with TBI often preferred high-tech aids and were more effective in using them than low-tech aids as a result (Hart et al., 2004).

Mild Cognitive Impairment and External Memory Aids

Greenaway, Duncan, and Smith (2012) examined the effectiveness of calendar/notebook intervention for 40 individuals with MCI. The researcher provided intervention for half of the participants while the other half of participants served as the control group receiving no treatment. The intervention trained the calendars/planners through the *Memory Support System* (MSS) a pocketsize calendar (2-pages per day) and note taking system. The individual with MCI and a partner of their choice received 12 1-hour MSS treatment sessions across six weeks. The intervention consisted of dividing the MSS into three section: 1) appointment, 2) "to do" items, and 3) journaling section. In addition, the training program integrated home practice using the MSS. The treatment group improved in activities of daily living and sense of memory self-efficacy more than those who did not receive MSS training. However, these changes were no longer evident six months after treatment ended. Despite the success of this intervention,

additional research is needed to investigate interventions designed to promote sustained gains and tech multiple types of EMAs.

Li et al. (2011) reviewed 17 studies that investigated interventions aimed to improve cognitive functions in individuals with MCI. Of those studies, few focused on group compensatory strategies and none of them directly trained a single-strategy (EMAs). That is, most of the studies that focused on compensatory strategies taught participants multiple strategies (e.g., visuospatial aids, computer-assisted training and mnemonics). Amongst these studies, cognitive improvements were noted, but there were minimal improvements in quality of life and activities of daily living. This review highlighted the lack of research examining the effectiveness of compensatory interventions for individuals with MCI. These types of intervention are aimed at improving individuals with MCI activities of daily living and generalizing to overall quality of life.

Given the limited evidence related to the use of compensatory strategies by individuals with MCI, consideration of other populations with memory impairments, such as dementia and TBI, is warranted. That is, clinicians and researcher may review studies examining the effectiveness of using EMAs with individuals who have cognitive impairments similar to people with MCI. By exploring research on similar populations, individuals may have an improved understanding of how best to train EMAs and what types of EMAs are successful with individuals who have cognitive impairments.

Dementia and External Memory Aids

Oriana et al. (1993) examined the effectiveness of using an electronic EMA to support individuals in the early stages of Alzheimer's Disease. The most success was noted when the participants used an electronic EMA with recording capabilities as compared to a written list or

no aid to support memory recall. The study attributed the participants' success in recall tasks to using the electronic EMA. The electronic EMA provides the automatic recall, which helps to compensate with the participants' deficits in memory. Because the study included people with mild dementia, the memory deficits will likely be similar to people with MCI. Specifically, people with MCI and people with mild Alzheimer's Disease both have deficits in prospective memory, but are able to learned strategies because their procedural memory is intact (Constantiniduo et al., 2012; Doty, 2007).

The same success may be observed in individuals with MCI using an EMA as seen in people with mild dementia. An EMA training program would be successful with both MCI and mild dementia due to the individuals' intact procedural memory skills (Constantiniduo et al., 2012; Doty, 2007). The study by Oriana et al. (1993) did not use a training program to teach how to use the EMA. Inclusion of a training program designed to teach EMAs may increase maintenance of skills.

Brain Injury and External Memory Aids

Studies have shown that using EMAs with individuals, who have mild to severe memory impairments following TBI, is effective in facilitating their performance during everyday activities (Cicerone et al., 2000; Sohlberg & Mateer, 1989). For example, Wilson, Emslie, Quirk, and Evans (2005) examined the impact of a pager system on reducing everyday memory and planning problems for 63 individuals with chronic TBI. The participants successfully used the pager system to reduce everyday problems that task their memory immediately following treatment and maintained these reductions 5 weeks after treatment. Fish, Manly, Emslie, and Evans (2008) examined the effectiveness of this treatment for people who had memory impairments following stroke. In this second study, the researcher found that similar to the

participants with TBI, individuals with stroke increased their goal attainment by 30% while using the pager. However, unlike the participants with TBI, the stroke participants did not maintain their gains 7-weeks post intervention (Fish et al., 2008). A comparison of these two studies indicated that the difference in post-treatment effects was due to the higher executive functioning skills of the participants in the first study compared to the second study (Fish et al., (2008) & Wilson et al., 2008). Individuals with MCI have relatively intact executive functions, particularly during the early stages, and therefore, may experience maintenance of gains from external aid interventions similar to those in first study (Wilson et al., 2008). Based on the studies examining EMAs for people with TBI, an external aid intervention may be beneficial for people with MCI.

Instructional Approaches

External memory aid training program. Successful use of EMAs requires systematic evidence-based instruction in their functional use. Sohlberg and Mater (1989) developed a formal training program consisting of teaching EMAs in three phases. The *acquisition* phase consists of the clinician asking several guiding questions to enhance the person's familiarity with the aid. For example, the clinician might ask "what could this be used for" or "how could you use this aid?" In the *application* phase the aid is used in role-play situations performed by the person and the clinician or another communication partner. Within the role-play situations the participants used the aid to have a communication exchange with another individual. The third phase, *adaptation,* is when the aid is used in a naturalistic environment. For example, practice within the person's home or job setting. In completing the third phase, the person is given realistic expectations and can expect inconsistencies. When the participant expects periods of

failed strategies use or experiences real life situations he or she is more likely to use the external aid long term (Sohlberg & Mateer, 2001).

Sohlberg and Mateer (1989) tested their training program on individuals with global amnesia resulting from brain damage. Their research found that individuals used the trained memory book strategy once training ended. The training program was extensive and participants were using the memory notebooks for six to eight months in daily sessions (Sohlberg & Mateer, 1989). For individuals with memory impairments, the goal of treatment is the generalization of compensatory strategies. Donaghy and Williams (1998) tested the training program on individuals with brain injuries. The researcher attributed the success of their treatment to the individualization of the aid, proper assessment of needs, and structured training exercises. In both studies, individuals with memory impairments resulting from brain injuries, benefitted from receiving training in using compensatory strategies (Dohaghy & Williams, 1998). Although these studies (Dohaghy & Williams, 1998; Sohlberg & Mateer, 1989) noted success, the participants' memory impairments were not a result of progressive diseases. Limited research exists for training programs for the use of external aids by people with MCI. Given the success in other populations, implementation of the three-step training program designed by Sohlberg and Mateer (1989), for example, may facilitate long-term effects of compensatory strategies with MCI.

Group therapy. In addition to long-term maintenance of gains, generalization to functional activities is another critical goal of rehabilitation programs. Many types of rehabilitation use group treatment to help people generalize improvements to functional activities (Marshall, 1993). Group therapy provides multiple opportunities to practice and learn from others to solve common issues that affect quality of life (Kurtz, 1997; Luterman, 1996;

Marshall, 1993). Kinsella et al. (2009) examined the effectiveness of early cognitive intervention for memory impairments in 52 participants diagnosed with MCI delivered via group treatment focused on a problem-solving approach. The five sessions taught the participants about memory as a multifactorial construct. The participants in the study by Kinsella et al. (2009) reported that group treatment was beneficial because they saw that others had the same problems that they experienced. Following group treatment, everyday memory significantly improved in participants as measured by prospective memory tasks. The participants also increased their knowledge and use of memory strategies as indicated on the Metamemory Questionnaire (MMQ) (Troyer & Rich, 2002). The researcher concluded that early intervention with this population via group treatment can minimize everyday memory failures (Kinsella et al., 2009).

Bourgeois (2013) expanded upon Kinsella's et al. (2009) study for MCI. Specifically, Bourgeois (2013) provided an initial examination of group intervention of individuals with a MCI with a focus on activity-based training. Her treatment plan emphasized the importance of goal-oriented treatment targets and group training. This early study examined eight participants with MCI who completed a 10-week group treatment program for memory impairments. Within the group treatment, the researcher taught multiple cognitive support strategies to participants (i.e., organization, routines, music, active observation and verbal elaboration). Participants who received therapy reported a significant improvement in the performance of everyday tasks that require memory skills. However, the researcher did not measure long-term gains in trained strategies. Maintenance of these gains could potentially be achieved if group therapy focused exclusively on a single strategy treatment such as the use of external aids. This would allow for greater repetition of concepts and information learned.

Repetition. There is limited research on the effect of repetition on training EMA strategy use for individuals with MCI. Therefore, research on repetition and individuals with TBI will assist researcher working with MCI. Chang, Hinze, Bowen & Starkey (2014) examined the benefits of cognitive strategies that individuals with TBI use. The researcher interviewed 17 participants with a TBI and found the participants agreed upon the importance of rehearsal/repetition memory aids for retrieval. Specifically the participants said, "Rehearsal/repetition involves receiving (i.e., seeing/hearing) the information repeatedly to prevent it from vanishing from short-term memory" (Chang et al., 2014, pg. 4). The researcher noted the success of repetition is due to the information remaining in short-term memory longer and improving the chances of transferring the information into long-term memory. If repetition increases the chances of transferring information into long-term memory, then repeated exposure to EMAs may enhance long-term maintenance of their use. Similarly, researcher suggest individuals should be provided repeated opportunities to use the information to establish a routine with newly learned information (Sohlberg & Mateer, 2001). Although no researcher specifically examined people with MCI, given the similarities in their memory deficits, an intervention program that uses repetition of key concepts may be beneficial. Providing the people with MCI with repeated opportunities may also help to establish a routine of using the newly learned information.

Current Study

MCI research is new and growing, but additional research is needed about how clinicians can best help individuals to compensate for memory impairments that may interfere with quality of life. The reviewed literature emphasizes the importance of choosing the most appropriate training program and types of EMAs. The reviewed limited evidence lacked information about

retention of skills taught post-intervention and did not support a change in activities of daily living. Therefore, examining the use of EMAs and group treatment with the MCI population will increase the knowledge base from which clinicians can select appropriate treatments. To date, no EMA treatments for people with MCI have included the three-phase approach and a group approach. The current study seeks to evaluate an intervention program that incorporates these features. Specifically, the researcher implemented an intervention program to examine the effects of group treatment on functional EMA use, cognitive abilities, long-term maintenance of skills, and EMA preferences.

The researcher examined the following questions in the current study:

1. Does group treatment for individuals with MCI increase their functional use of external memory aids to compensate for memory impairments?

2. Does group treatment for individuals with MCI change their memory and cognitive skills post-treatment?

3. Does group treatment for individuals with MCI provide retention of external memory aid use and cognitive skills 6-weeks post-intervention?

4. Which types of external memory aids to individuals with MCI prefer?

CHAPTER II

Methods

The study is a between and within group design. The researcher measured dependent variables at pre-test, post-test and follow-up group design.

Table 1. Participant demographics.

Participant	Group	Age (years)	Years of Education	Vision Screening	Hearing Screening	MoCA Score
1	1	88	12	Pass	Pass	24
2	1	72	14	Pass	Pass	24
3	1	86	12	Pass	Pass	22
Average	1	85	12			23
4	2	74	12	Pass	Pass	21
5	2	75	14	Pass	Pass	23
6	2	75	14	Pass	Pass	24
Average	2	72	13			23

Participants

Six females with mild cognitive impairment (MCI) participated in this study. The researcher randomly divided participants into two groups of three people each. Group 1 received group treatment, while the Group 2 remained on a waiting list to receive treatment after six-weeks post pre-treatment. All participants were between the ages of 72 and 88 years with a mean age of 82 years for Group 1 and 75 years for Group 2. The participants reported no prior learning or language impairments and spoke English as their first language. The participants all lived alone without assistance at the same senior retirement apartment building. Two participants were African American and four were Caucasian. All participants scored below a 26 on the Montreal Cognitive Assessment (MoCA), which indicates lower cognitive skills typically associated to MCI or Dementia. Participants were distinguished from individuals with dementia in that according to self- and family-report they independently complete basic activities of daily living

(Petersen, 2007). Prior to treatment, the mean MoCA score was a 23/30 for both groups (range

of 21 to 24; standard deviation 1.26). The participants passed a hearing, vision, and upper

extremity motor screenings. Two participants hearing screening level (for the left and right ear)

was 35dB for frequencies of 500 Hz, 1000 Hz, and 2000 Hz. One participant's right ear was

40dB and left ear was 45dB for frequencies of 500 Hz, 1000 Hz, and 2000 Hz. The researcher

excluded participants with a self-reported history of depression or psychiatric illness that

resulted in hospitalization within the last two years.

Materials

   Screening Materials. Screening materials included the demographic form, hearing

screening, a vision screening, and the MoCA. The researcher used a demographic form to

document participants' medical history and self-reported ability to complete activities of daily

living. The researcher asked five questions related to functional upper extremity use from the

Disabilities of the Arm, Shoulder and Hand (DASH) to screen for the presence of upper limb

motor skill impairments that might infer with study tasks (Gummesson, Atroshi, & Ekdahl,

2003). Each participant answered "yes," indicating that she could complete the task described in

the five items (see Appendix A). The participants' hearing was assessed at several frequencies

(i.e.,500 Hz, 1000 Hz, 2000 Hz) using an audiometer. The vision screening consisted of a visual

scanning task. The visual scanning task was on a white piece of paper with 18-point font. On the

paper were 5 rows of four written names each. Within each row the participant identified her

name from foil names (see Appendix B). Once the demographic form, hearing and visual

screening were completed the MoCA was administered. The MoCA briefly assessed seven main

areas of cognitive abilities: orientation, short-term memory, executive functions, language,

visuospatial abilities, attention, and concentration. The MoCA is an appropriate assessment tool

for the current study due to its high sensitivity (90-96%) in detecting MCI (Nasreddine et al., 2015). The maximum score on the MoCA is a 30 and a score of below 26 was used as the criterion for MCI.

Assessment Materials. The researcher used various assessment materials to formally and informally evaluate and describe the participants' cognitive skills, perceived memory skills, use of memory strategies, and functional use of EMAs.

General cognitive skills. The Arizona Battery for Communication Disorders of Dementia (ABCD) (Bayles & Tomoeda, 1993) is a comprehensive battery used to quantify cognitive-linguistic deficits. The *Immediate-Recall* and *Delayed-Recall* subtests were used during this study. The maximum score on both subtests is a 17.

Participant perceptions. The Multifactorial Memory Questionnaire (MMQ) evaluates self-reported memory skills and use of EMAs/strategies across three subtests (MMQ-Ability, MMQ-Strategy and MMQ-Contentment) (Troyer & Rich, 2002). The MMQ is composed of 57 questions answered on a five point Likert scale from "all of the time" to "never." The MMQ-Ability subtest measured the participants' perception of their memory skills. The MMQ-Strategy subtest described the participants' use of EMAs. The MMQ-Contentment subtest examined the overall satisfaction of the participants' memory abilities. Together the MMQ-subtests provided a multidimensional self-report of the participants' memory, which is relevant in the research and clinical setting. Researcher have used the MMQ with individuals who have a MCI for the purpose of examining patient and caregiver perceptions of memory abilities and strategy use (Bourgeois, 2014; Kinsella et al, 2009). The maximum score on all three subtests is an 80. A high score on the MMQ-Contentment subtest indicates positive feelings and on the MMQ-

Strategy subtest indicates the individual uses strategies often. A high number on the MMQ-Ability subtest indicates a large number of mistakes made due to one's memory ability.

Functional strategy use. The researcher designed a Role Play Activity to measure the participants' cognitive abilities and use of memory aids/strategies in a simulated functional activity. The Role Play Activity involved a pre-recorded voicemail played for each participant. Prior to the playing of the voicemail, the participants were told they could use any of the EMAs on the table (i.e.,notepad, calendar or iPad). The voicemail included information about a fictitious upcoming event (i.e.,Birthday Party or Doctor's Appointment). After the voicemail was played, the participant had to retrieve seven facts from the voicemail provided wh-questions from the researcher. Each time the participant completed the Role Play Activity there was different information recorded to reduce practice effects. For example, the type of appointment changed during each assessment. Materials needed for the role-play include an iPad, paper, pencil, timer and monthly calendar.

Post-treatment questionnaire. A questionnaire (Appendix C) was given to the participants to gather information about their selection of EMAs and the rationale for their preferences. The questionnaire consisted of six open-ended questions that were asked in a one-on-one interview with the researcher during the final assessment session. Within each category of EMAs the participant indicated which type of EMA they preferred and why during the post-treatment assessment.

External memory aids. The researcher provided a variety of EMAs to the participants to use during the assessment and treatment sessions. The aids included a range of no-tech to high-tech aids. Each of these aids is described below (See Table 2). Some of these EMAs were used only during assessment and treatment sessions and other materials the participants were

permitted to take home. The participants were introduced to and instructed on the use of all of these materials listed below, but selected those to focus on based on preferences and availability of aids. Refer to Appendix E for images of the EMAs.

Table 2. Types of external memory aids.

Calendars	Timers	Personal Information
Calendar on iPad	Alarm and Stopwatch on iPad	Notes on iPad
Paper Monthly	Stopwatch	Memory Wallet
Planner (weekly and monthly)	Hand Held: manual and electronic clip-on	Planner (contacts, passwords and notes pages)

Calendars. The researcher used electronic and paper calendars**.** An electronic calendar was accessed on an iPad. The electronic calendar provided monthly, weekly and daily views. There were two types of paper calendars provided to the participants. The first type was a calendar in the form of a planner with a weekly and monthly view. The planner was 6x4 inches and included every month and week of the year. The second version of a calendar was a monthly version 12x10 inches that hung on the wall. The researcher provided the participants with the paper monthly and planner view to use during home practice.

Timers. An electronic timer/alarm used was on the iPad. The researcher provided an electronic stopwatch and handheld timers (a digital clip on and manual dial version). The timer was used as a reminder to complete tasks at a certain time or to help one allot time to better manage their schedule. The participants were provided with the electronic stopwatch and handheld timers to use during home practice.

Personal information. Important personal facts were recorded using three types of EMAs. The first aid was the notepad application on an iPad. A 12-slot double-sided business card memory wallet was provided to each participant. The participants also learned about using

the note section in the back of their planner. The notes section was divided into 10 pages (i.e.,3

pages for addresses, 3 pages for passwords and 4 pages were blank with lines). The memory

wallet and planner were both given to the participants to use during home practice.

Procedures

Participants completed up to nine total sessions all taking place at the senior retirement

apartment center the participants reside. Most sessions were conducted in the group meeting

room at the apartment center and one individual session was conducted in the participant's

apartment living room. Each participant completed an individual pre-treatment session, then six

weekly treatment sessions. Group 1 participants also completed individual assessment sessions

immediately post-treatment and at six-weeks follow-up. Group 2 participants completed

individual assessment sessions at six-weeks following pre-treatment (second pre-treatment

session) and immediately post-treatment (See Table 3 for the complete schedule). All individual

assessment and group treatment sessions lasted approximately 90 minutes.

Table 3. Study procedures.

Groups	Week 1	Weeks 2-7	Week 8	Weeks 9-15	Week 16
Group One	Pre-treatment Assessment	Group Treatment	Post-treatment Assessment	No Treatment	Follow-up Assessment
Group Two	Pre-treatment Assessment	No Treatment	Second Pre-treatment Assessment	Group Treatment	Post-treatment Assessment

Pre-treatment. During the individual pre-treatment assessment session, the participants

completed the vision and hearing screenings, and a medical history interview guided by the

demographic form. Then, the participants completed the MoCA for screening and descriptive

purposes. If the participant met the study criteria, the researcher administered the ABCD-

subtests and MMQ-subtests. Seven individuals were screened and one did not meet the study criteria, because she scored above 26 on the MoCA.

Next, the participants completed the Role Play Activity, during which they listened to a pre-recorded voicemail with seven important facts about an upcoming appointment or event. Before playing the voicemail the researcher said "I am going to play a message to you and ask you to remember some facts from the message. You can use anything on the table to help you if you want." The researcher asked the participant seven wh-questions one-minute post voicemail, in which she had to retrieve the seven facts. The researcher used a data collection chart to measure two areas: accuracy of response and use of external memory aid (see Appendix D). The MoCA, ABCD-subtests and MMQ-subtests were re-administered to participants in Group 2 during their second pre-treatment session. The pre-treatment and second pre-treatment assessments were each completed in a single session for approximately 90 minutes.

Treatment. Each participant completed six weekly, 90-minute MCI group treatment sessions. Three categories of external aids (i.e., timers, calendars and personal information) were emphasized across the six sessions. Two non-concurrent sessions were dedicated to each category of aids (refer to Table 4 for EMA schedule). Evidence suggests that this distributed practice approach is most appropriate for people with memory impairments (Sohlberg & Mateer, 2001). During sessions 1 through 3, EMAs were introduced and the researcher encouraged the participants to explore the EMAs. Prior to treatment, the researcher encouraged the participants to bring in any EMA that they currently used within each category. Four participants brought in calendars (three monthly and one pocket size calendar). One participant brought in a timer and no participants brought in a memory wallet or notebook. The participants who brought in an EMA indicated higher use of the EMA on the MMQ prior to treatment than the participant who

17

did not bring an EMA. Although some participants brought in EMAs, all six participants preferred the types of EMAs learned in treatment. During sessions 4 through 6, the participants selected preferred types of aids within each category and discussed how they incorporated the aid into their everyday lives. For example, within the calendar category each participant chose from a monthly paper, weekly paper, or electronic calendar to focus on during the session and home practice.

Table 4. Intervention schedule overview.

Week 1	Calendars
Week 2	Timers
Week 3	Personal Information
Week 4	Calendars
Week 5	Timers
Week 6	Personal Information

Introduction of the treatment approach. The researcher provided the participants with a schedule of the six-week treatment program. Next the researcher described the plan and expectations for the next six weeks to the participants. The categories of EMAs and types within were briefly described to the participants. The researcher informed the participants of what would be asked of them during the treatment and for home practice.

Introduction of a new category of external aids. The Sohlberg & Mateer (1989) approach to teaching EMAs was administered during the treatment. The aids were taught use three training phases: *acquisition, application* and *adaptation*. The introduction of a new category of external aids portion of treatment was the *acquisition phase*. The first category of external aids was explained to the participants using a handout for visual support (see Appendix F). The researcher modeled the use of each aid within that category. The researcher discussed how to use each aid and described situations that are appropriate to use the aid. For example, she explained that

calendars can be used to record appointments and important dates. The researcher explained

appropriate situations to use the timer such as, during cooking or while exercising. Finally, the

researcher provided emergency contacts or grandchildren's clothing sizes as examples of

information to record in memory wallet. The researcher guided the participant's exploration of

the features of each aid during the acquisition phase. For example, the researcher said, "I want

everyone to open their planner and find March 3rd on the weekly and monthly view." The

participants also shared how they currently use the types of EMAs and what other situations

would be appropriate.

 Functional practice. The next phase was the *application phase.* The *application phase*

involved various role-play scenarios using the aids to promote functional EMA use. For

example, during the application phase, the researcher said, "If your friend is having a surprise

birthday party, how can you use this aid to remember the date and time of the party and that it is

a surprise. Show me…. ". Group members were instructed to provide each other feedback and

brainstorm alternative approaches. During this phase for sessions 1-3, participants used each

type of EMA to complete the role-play scenarios. This allowed for participants to have exposure

to all EMA types and have multiple opportunities to practice using the EMAs. During sessions

4-6, the participants completed the role-play scenarios using the preferred type of EMA.

Participants often chose to use all three types and had a large amount repetitive use of each

EMA. Approximately five role-play scenarios were completed during this phase of treatment

resulting in repetitive practice. The participants watched and worked with one another during

this portion of treatment. Refer to Table 5 for examples of the topics for the role-play scenarios.

Table 5. Examples of role-play scenario topics.

Calendar	Timer	Personal Information
A. Schedule Appointments	A. Time in Oven	A. Emergency Contact
B. Schedule Dinners	B. Workout Routine	B. Doctor's Name
C. Organize Rides for Grandchildren	D. Remember to get Laundry	C. Grandchildren Clothing Sizes

Explanation of home practice with new aids. The final phase was the *adaptation phase*, which involved using the aid in a naturalistic environment and took place as part of home practice. At the end of each session, the researcher provided a home practice handout as a part of the *adaptation phase* (refer to Appendix G). The handout provided questions to have the participants reflect upon their experiences using the aid throughout the week. There was no penalty if the participants did not complete the homework. The homework promoted generalization and worked towards establishing a routine of using the aid. All six participants completed homework and shared examples of positive and negative functional EMA use.

Review of home practice activity. Following their home practice with a category of EMAs, the participants started the next session with group discussion. The participants explained how they used the aid during the home practice activity and provided each other with suggestions (participants referred to their home practice handout throughout the discussion). The researcher facilitated the flow of the discussion and summarized how each participant used the EMAs. On occasion, the researcher provided questions to expand upon the conversation. The researcher told each participant if she used the aid appropriately or recommended a different approach for the future if an EMA did not work appropriately. Each individual explained what worked or did not work during home practice. The participants also explained what they did and did not like about the aids. Throughout the discussion the participants provided feedback to each other and

indicated similarities and differences in their experiences. All of the participants reported

completing the home practice each week and participated in group discussions. One participant

did not attend a treatment session, but the other participants independently (outside of treatment)

taught her about the EMA category and gave her the home practice sheet. The participant

returned the following session and discussed the home practice from the session she missed. The

participants often used one another's ideas and altered their EMA use based on the home

practice discussion. For example, one participant shared how she included her funeral

arrangements in her memory wallet and the other two participants immediately included this into

their memory wallets. Refer to Table 6 for a summarized description of the six intervention

sessions.

Table 6. Description of the intervention sessions.

Session 1 included:
1. Introduction of the treatment approach
2. Introduction of the first category of external aids
3. Intensive and repetitive practice of aids
4. Explanation of home practice with new aids

Sessions 2-3 included:
1. Review of last week's category of external aids and home practice activity
2. Introduction of a new category of external aids
3. Intensive and repetitive practice of aids
4. Explanation of home practice with new aids

Sessions 4-6 included:
1. Review of last week's category of external aids and home practice activity
2. During sessions 4-6 the participant chose the aid within the category she will focus on
   Selection was based on comfort level, perceived benefit, and availability
3. Functional practice. Discussed how to establish a routine using the aid
4. Explanation of home practice with one aid

Post-treatment. Participants in Group 1 completed individual post-treatment assessment

sessions at two points in time: within 1 week and six-weeks post-treatment. Participants in

Group 2 completed a single post-treatment assessment session within 1 week post-treatment.

Within these testing periods, the researcher administered the MoCA, Role Play Activity, ABCD-subtests, and MMQ-subtests. During each Group's immediate post-treatment session, the participants completed the post-treatment questionnaire.

Data Analysis

Table 7. Between group and within group analysis.
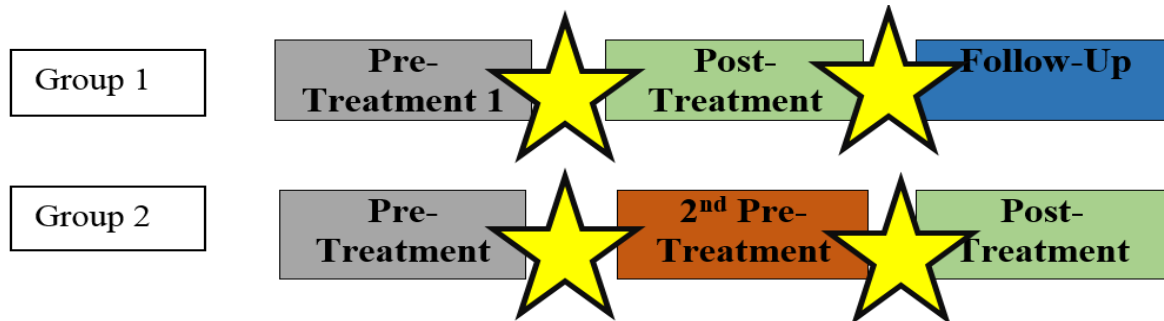
Between group and within group analysis. The small sample size for both groups, although appropriate for a preliminary study, limited the statistical analyses. Results of formal and informal assessments were described between and within groups. The researcher compared Group 1's pre-treatment, post-treatment, and follow-up scores (see Table 7 stars across group 1). Within Group 2's participants' scores the researcher compared pre-treatment, second pre-treatment and post-treatment scores (see Table 7 stars across Group 2). The scores of Group 1's pre-treatment assessment scores were compared to Group 2's pre-treatment assessment scores to measure the equality of the groups (see gray boxes on Table 7). Group 1's post-treatment scores were compared to Group 2's second pre-treatment scores after six-weeks on the wait list to measure if treatment changes performance.

Formal. The researcher measured changes in performance immediately following intervention for Group 1 and 2 and the maintenance of these changes for Group 1 at six-weeks

post-treatment. The MoCA, ABCD-subtests, and MMQ-subtests scores were evaluated at baseline and post-intervention sessions (refer to Table 7).

Informal. A data collection sheet was used for the Role Play Activity. Participants received two scores: the number of accurate of responses (participant could receive a minimal score of zero and maximum score of seven) and the instances and type of EMA used. The results of the groups were compared within and between groups (refer to Table 7). In addition, the researcher analyzed the post-treatment questionnaire across all six participants and Group 1 compared to Group 2 responses.

Reliability. All of the sessions were recorded using a portable video camera. A second rater (i.e., a speech-language pathology student) reviewed all participants' Role Play Activity performance.   No discrepancies were noted between the researcher and the second rater.

CHAPTER III

Results

Functional External Memory Aid Use

   Role play activity. Five participants increased or maintained their success within the Role Play Activity post-treatment (Table 8 and 9). The participants' mean score of 4.5 pre-treatment increased to a mean of 6 post-treatment (7 is the maximum score). Before treatment, 2 participants used written notes on paper (similar format to the planner notes section) and 4 did not use an EMA. After treatment, 5 participants used written notes and 1 participant attempted to use an iPad, but typed too slow. Due to the rate of information from the voicemail, the participant was unable to type fast enough on the iPad to collect all of the details. The participant recognized this problem and attempted to switch to using written notes after presentation of half of the information items from the voicemail. Overall, the participants increased or maintained (one participant maintained the maximum) their performance when using a no-tech EMA.

   The Role Play Activity pre-treatment mean scores differed for each group. However, Group 1's mean increased from 3 to 6 following treatment. Group 2's mean score maintained at 5 when measured at the second pre-treatment session. During post-treatment, all of Group 1 participants used an EMA. In contrast, the two Group 2 participants (participant 5 and 6) who did not use an EMA at pre-treatment also did not use an EMA during the second pre-treatment assessment (see Tables 8 and 9).

Table 8. Group 1 participants' Role Play Activity scores.

Group 1					
	Pre-Intervention		Post-Intervention		Follow-Up Intervention	
	Success (7)	EMA type	Success (7)	EMA type	Success (7)	EMA type
P1	5	None	6	Write	7	Write
P2	5	Write	6	Write	7	Write
P3	0	None	6	Write	3.5	None

Table 9. Group 2 participants' Role Play Activity scores.

Group 2					
	Pre-Intervention		2nd Pre-Treatment		Post-Intervention	
	Success (7)	EMA type	Success (7)	EMA type	Success (7)	EMA type
P4	7	Write	7	Write	7	Write
P5	6	None	4	None	7	Write
P6	4	None	6	None	4	iPad/Write

MMQ-Strategy. The MMQ-Strategy subtest measured the participants' self-reported use of cognitive compensatory strategies (Figures 1 and 2). Higher scores indicated greater use of strategies to compensate for memory impairments (MMQ-Strategies). A slight increase from 52 to 54 on the MMQ-Strategy was noted post-treatment. All but one participant increased their MMQ-Strategy score post-treatment (refer to Figures 1 and 2). Group 1 and 2 MMQ-Strategy scores were unequal at pre-treatment, however a larger change was noted post-treatment for Group 1 then Group 2's second pre-treatment score. The MMQ-Strategy Group 1 participants' mean score increased by 4 points during post-treatment assessments (i.e., 36 to 40). Group 2

participants' second pre-treatment mean score of 39 increased by 1 point from pre-treatment (refer to Figure 1 and 2). Within the MMQ-Strategy were three questions that relate to the EMAs taught during treatment (i.e., Questions 1, 5, and 15). Five participants reported using a calendar all of time or often during pre-treatment assessment. Post-treatment five participants reported continued calendar use all the time or often. Five participants reported using a timer rarely or never prior to treatment. Post-treatment, only one participant reported rarely using a timer. Although memory wallet use was not specifically asked about on the MMQ-Strategy subtest, some participants reported that they wrote in a notebook during pre-treatment assessments. Two participants reported never using a notebook during pre-treatment assessments. Post-treatment all six participants reported using a notebook on a scale of sometimes to all the time.

      Additional participant perceptions. The MMQ-subtests also provided additional data regarding the participants' feelings about their memory (MMQ-Contentment) and their mistakes made due to memory (MMQ-Ability). Higher scores indicate positive feelings about one's memory (MMQ-Contentment) and fewer mistakes related to memory (MMQ-Ability). All participants maintained or increased positive feelings on the MMQ-Contentment during post-treatment assessment (i.e., mean increased from 52 to 53) (refer to Figures 3 and 4). The participants maintained a mean of 49 post-treatment on the MMQ-Ability (refer to Figures 5 and 6). The MMQ-Contentment pre-treatment group means were equal (i.e., 52). Following treatment, Group 1' mean score increased to 54 and Group 2's second pre-treatment mean score decreased to 46 (refer to Figure 3 and 4). Although the MMQ-Ability subtests pre-treatment group means were unequal, a greater increase was noted in both subtests for Group 1 post-treatment compared to Group 2 second pre-treatment assessment. Group 1's MMQ-Ability mean

score increased by 1 point at post-treatment (i.e., 46 to 47), but there was a large range of scores (i.e.,39-52). Only participant two increased her score during post-treatment assessment from Group 1 (refer to Figure 5). Group 2's pre-treatment mean score of 52 was maintained at second pre-treatment assessment (see below Figure 6).
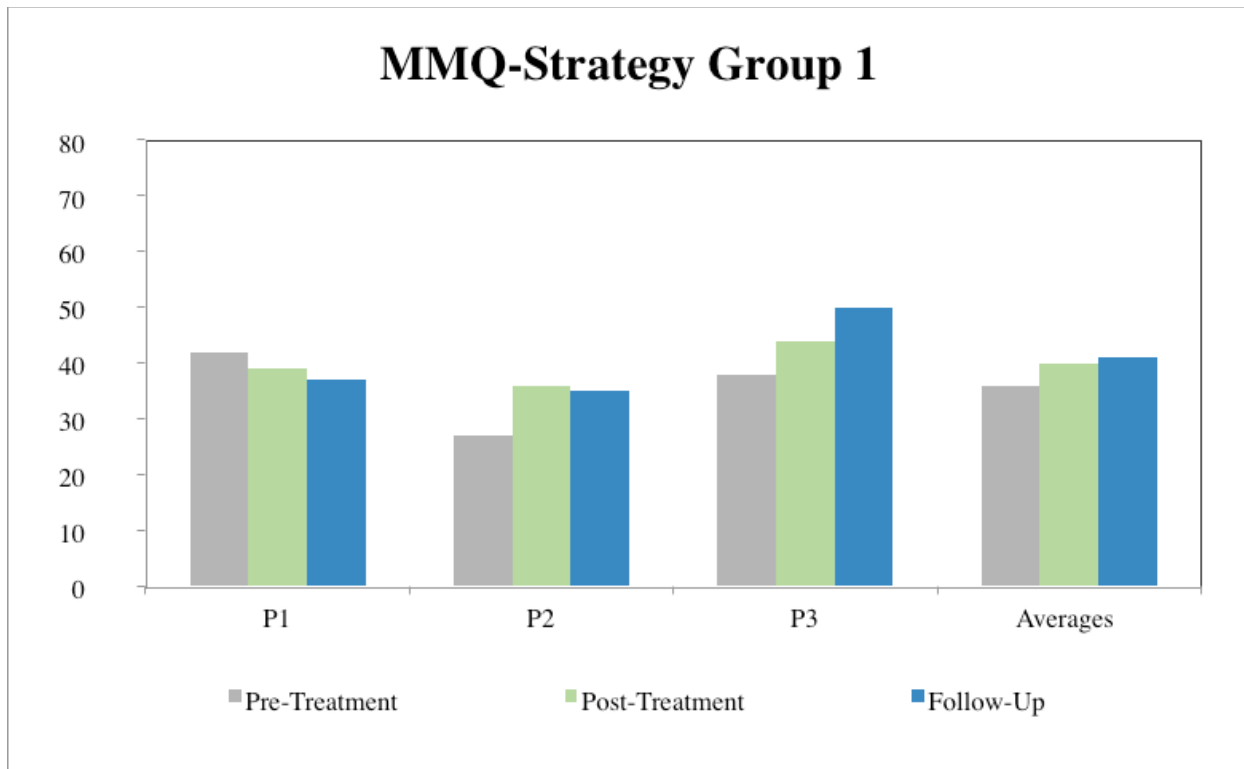
Figure 1. Group 1 participants' MMQ-Strategy scores.
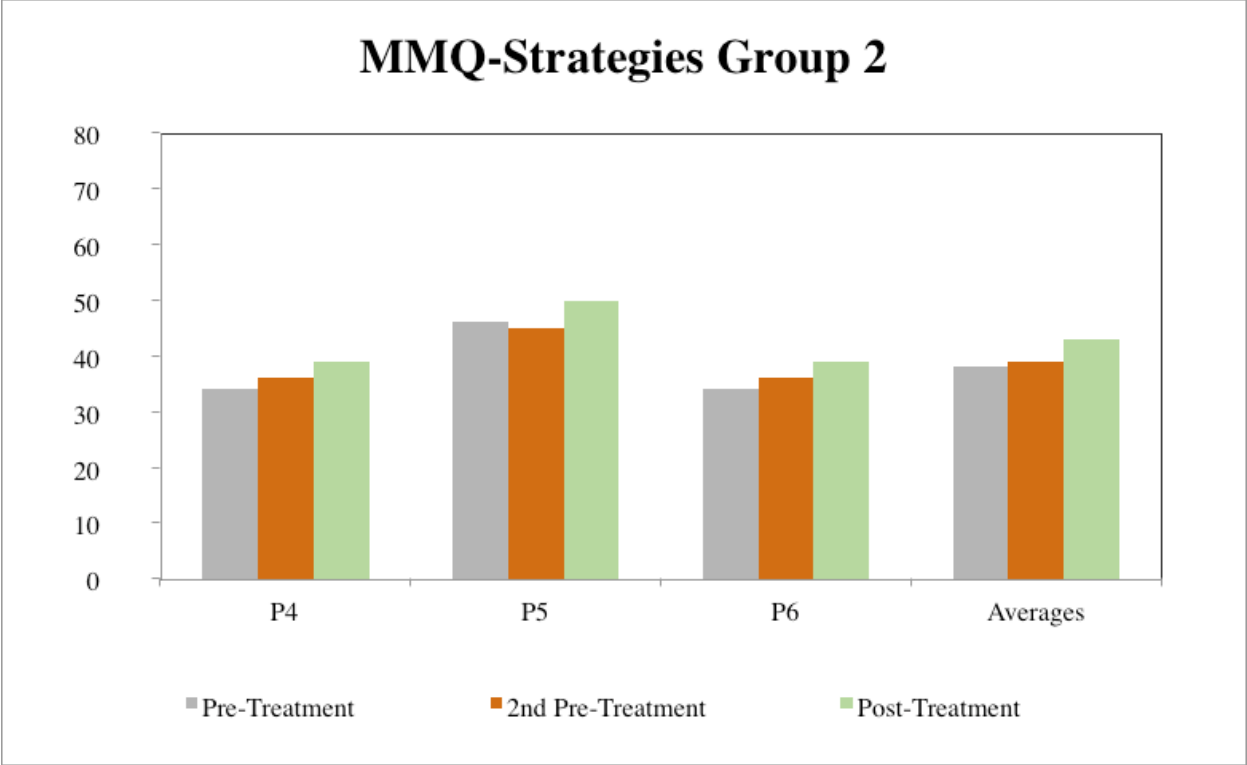
Figure 2. Group 2 participants' MMQ-Strategy scores.
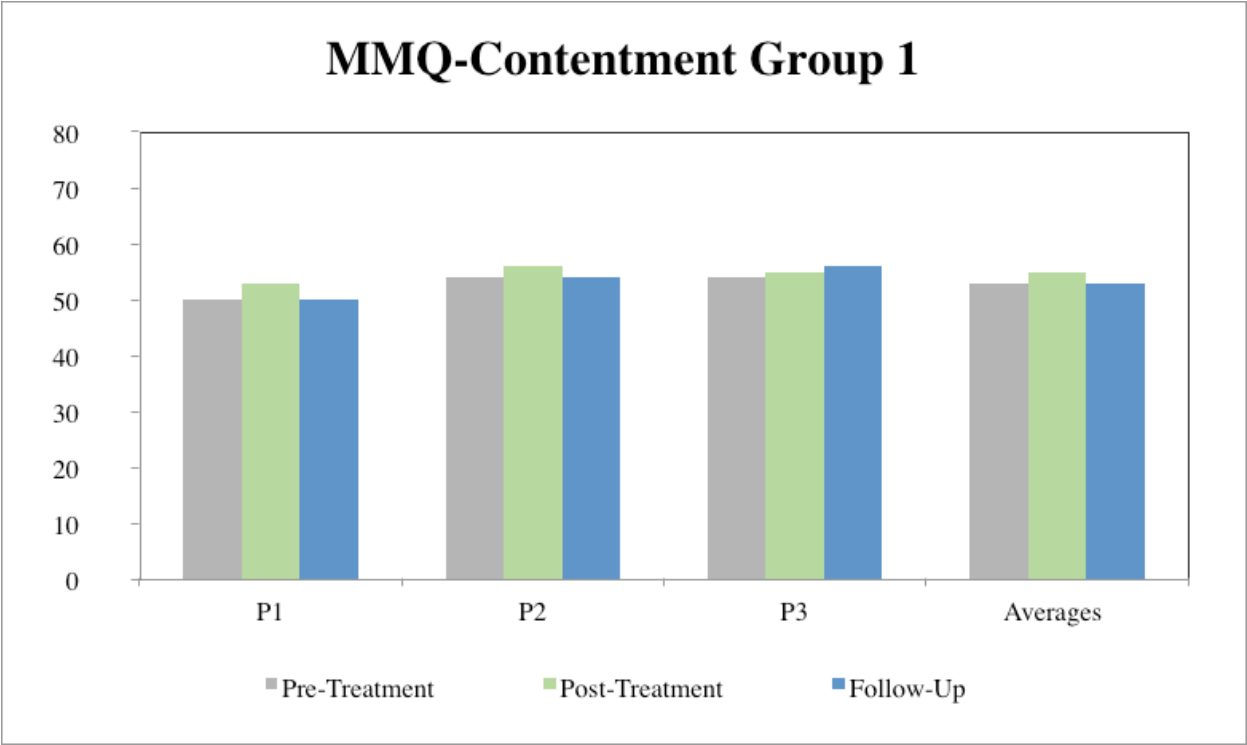
Figure 3. Group 1 participants' MMQ-Contentment scores.
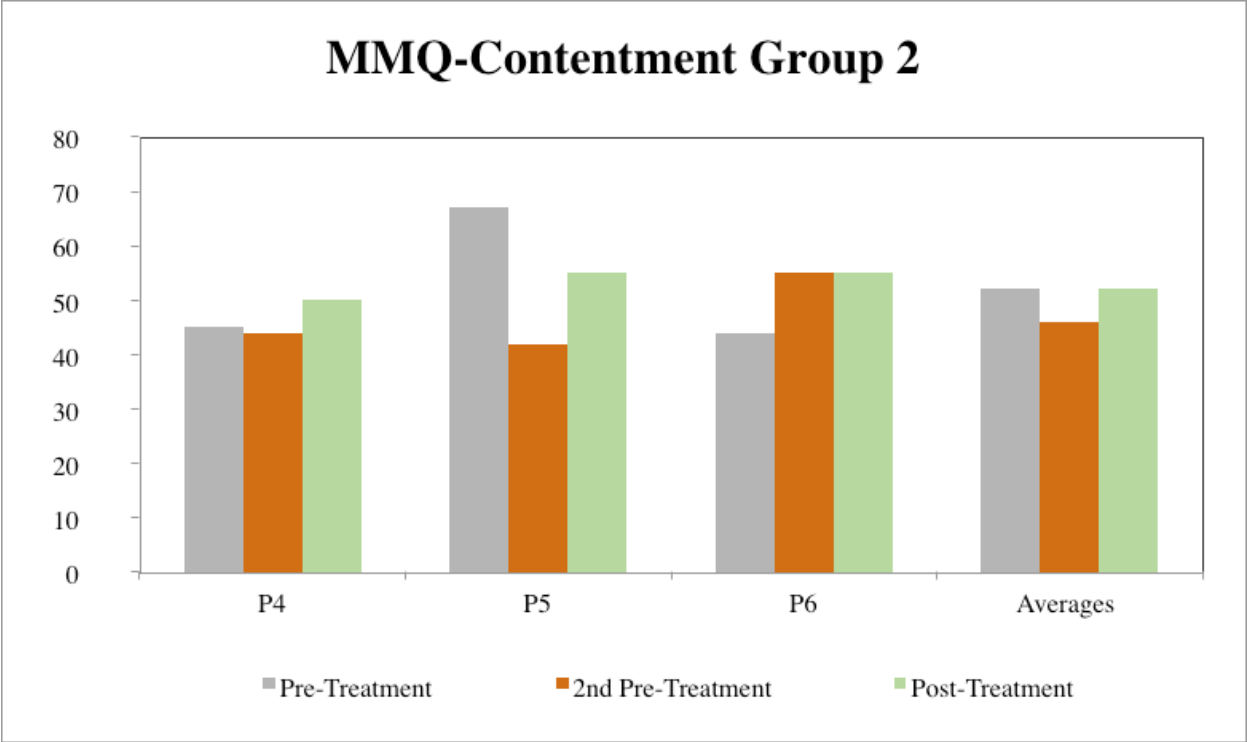
Figure 4. Group 2 participants' MMQ-Contentment scores.
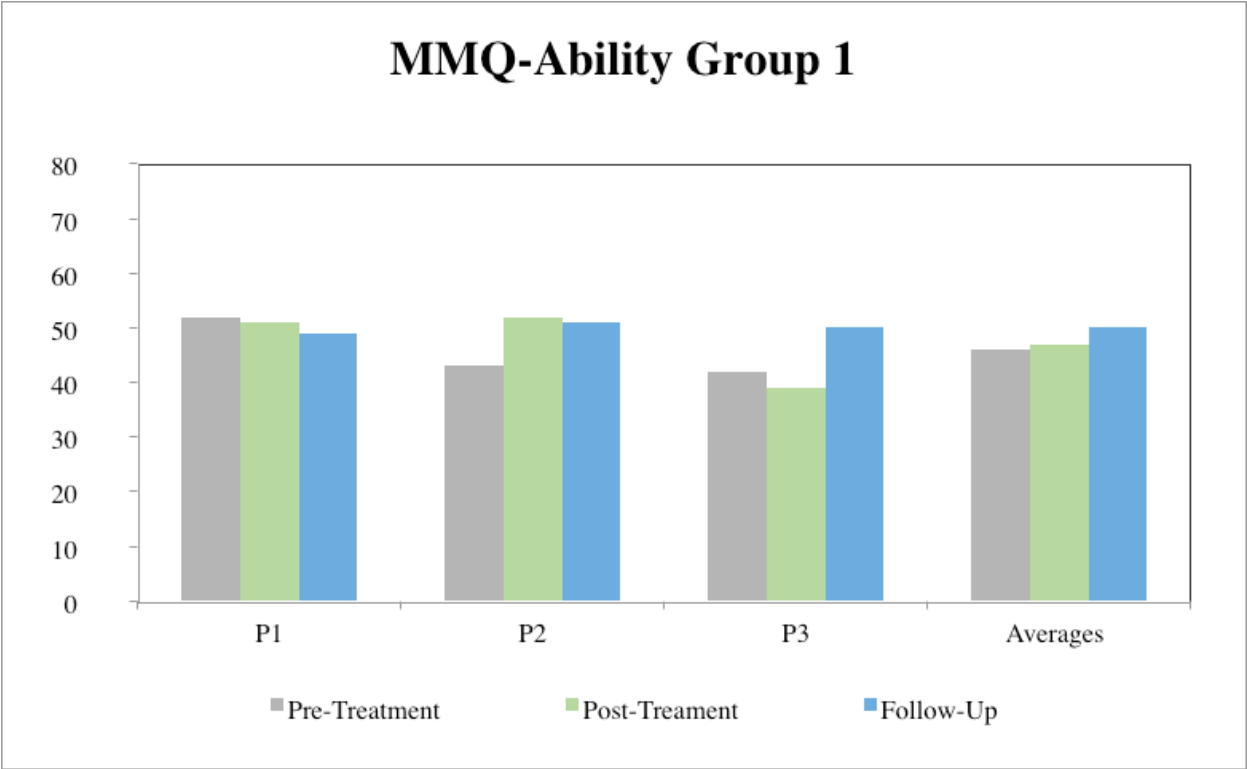
Figure 5. Group 1 participants' MMQ-Ability scores.
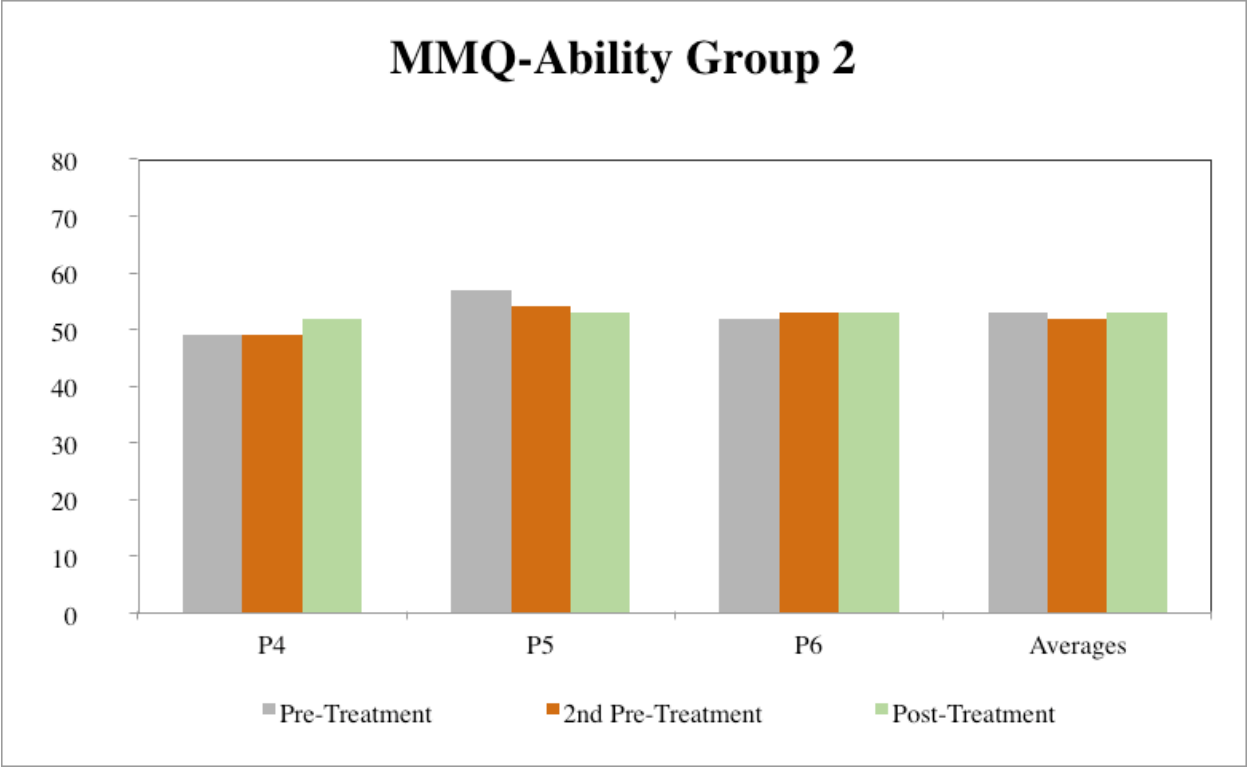
MMQ-Ability Group 2

Figure 6. Group 2 participants' MMQ-Ability scores.

Cognitive Skills

MoCA. All of the participants demonstrated increased MoCA scores post-treatment (refer to Figures 7 and 8). The pre-treatment mean of 23 increased by 4.5 points at post-treatment (the maximum MoCA is 30). Specifically, all six participants demonstrated increased delayed recall subtest scores. Five participants' post-treatment scores were above a 25, which is the MoCA cutoff score used to indicate a cognitive impairment (Nasreddine et al., 2015).

The groups' equal pre-treatment MoCA means suggest that treatment may have resulted in changes observed on this measure of cognitive skills. Specifically, Group 1 participants' average score changed from 23 to 27.6 following treatment and Group 2 participants' average score changed from 23 to 24 during the same time period without treatment (refer to Figure 7 and 8).
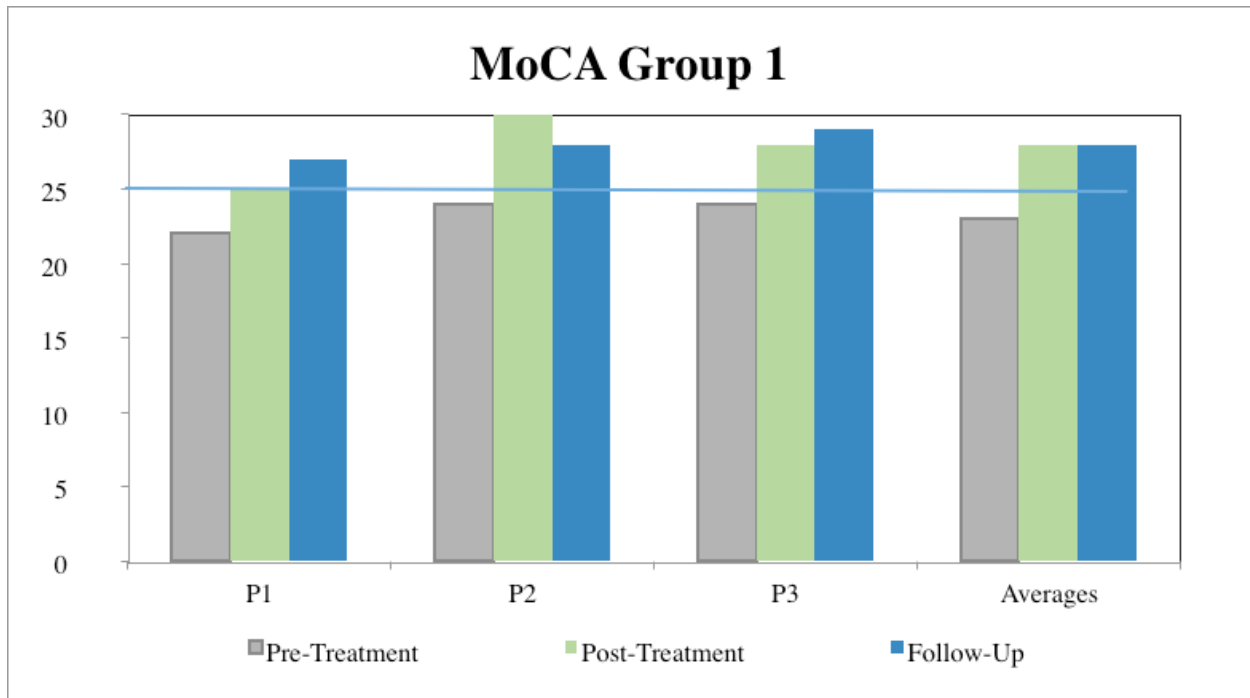
Figure 7. Group 1 participants' MoCA scores.
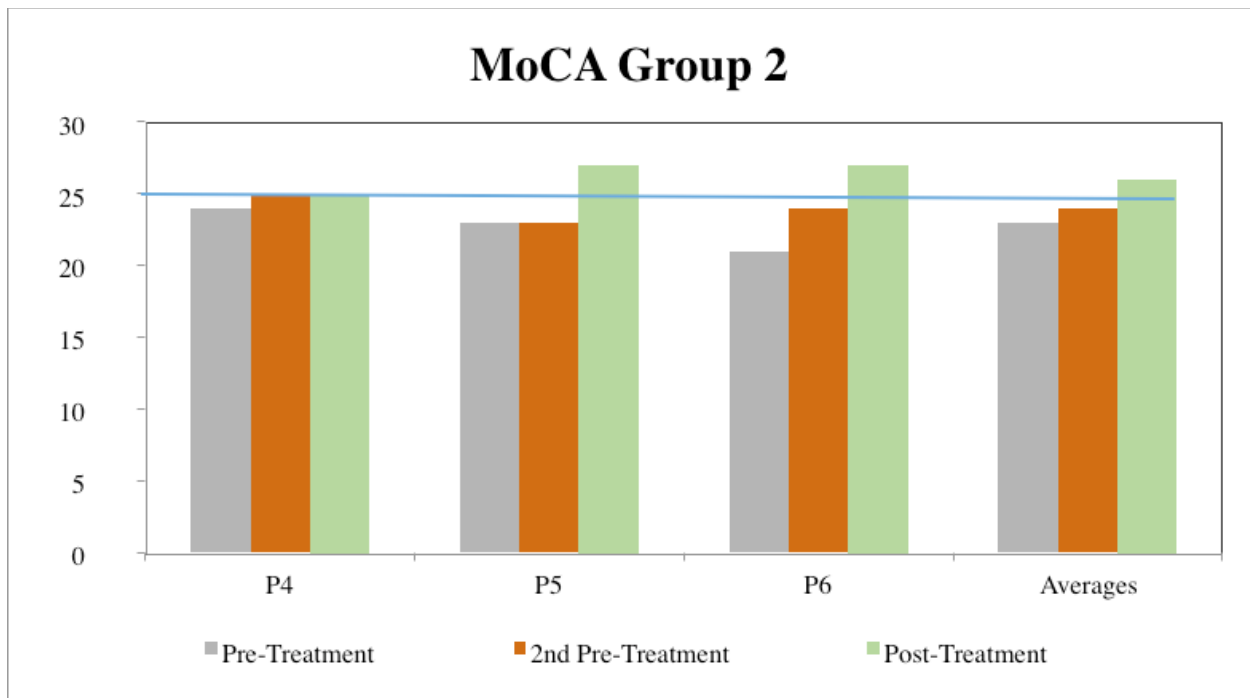
Figure 8. Group 2 participants' MoCA scores.

ABCD-subtests. Five participants increased or maintained their ABCD *Immediate-Recall* and 4 participants increased or maintained their *Delayed-Recall* subtest scores post-

treatment (refer to Figures 9 to 12). Four participants increased their scores and one participant maintained her perfect score on the *Immediate-Recall* subtest. On the *Delayed-Recall* subtest, two participants increased their score and two maintained their score during post-treatment assessments. The participants' collective mean *Immediate-Recall* subtest score increased from 12 to 14 out of 17. Additionally, the participants' collective *Delayed-Recall* subtest mean score of 13 out of 17 was maintained post-treatment.

The ABCD *Delayed-Recall* subtest pre-treatment group means were not equal; however, compared to Group 1's post-treatment scores, Group 2's second pre-treatment mean score decreased without treatment suggesting a potential effect of treatment (see above Figure 11 and 12). Specifically, Group 2's second pre-treatment mean score decreased by 2 points (i.e., 12 to 10), while Group 1's mean post-treatment scores of 14 was maintained. Group 1 participants' mean score increased on the ABCD *Immediate-Recall* subtest post-treatment from 13 to 15 (refer to Figure 9). In contrast, Group 2 participants maintained their mean score of 11 at the second pre-treatment assessment (refer to Figure 10).
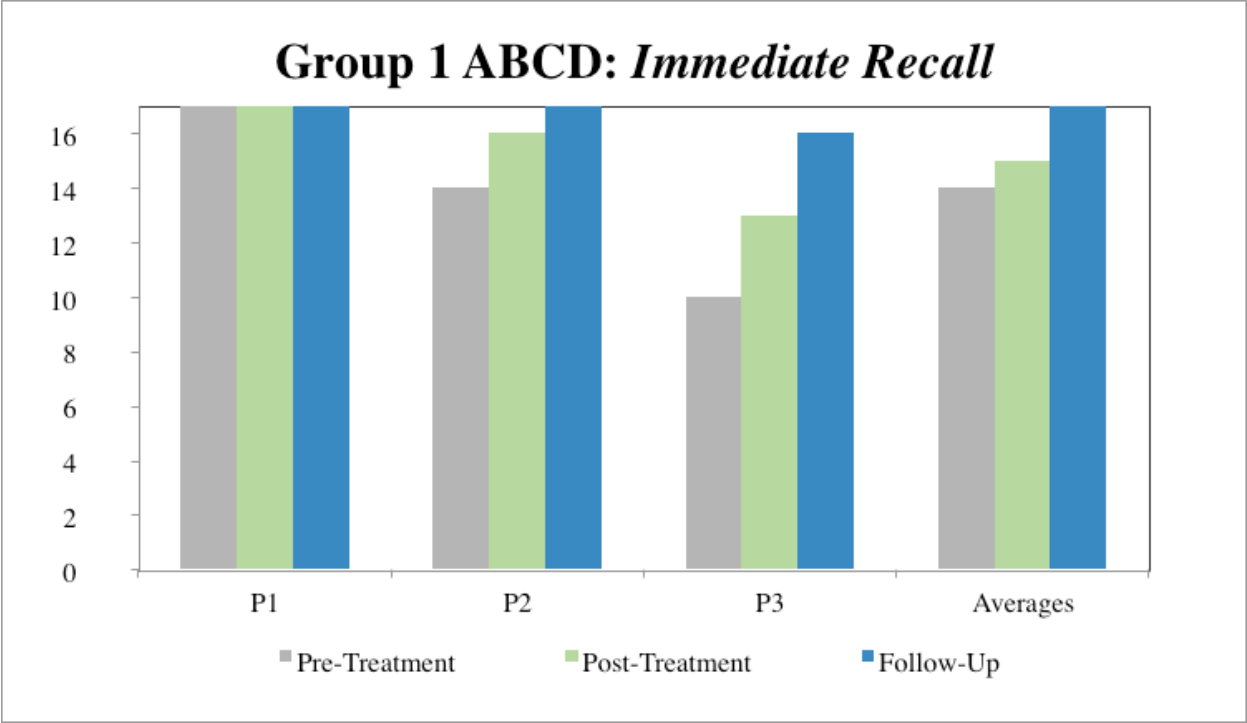
Figure 9. Group 1 participants' ABCD *Immediate-Recall* subtest scores.
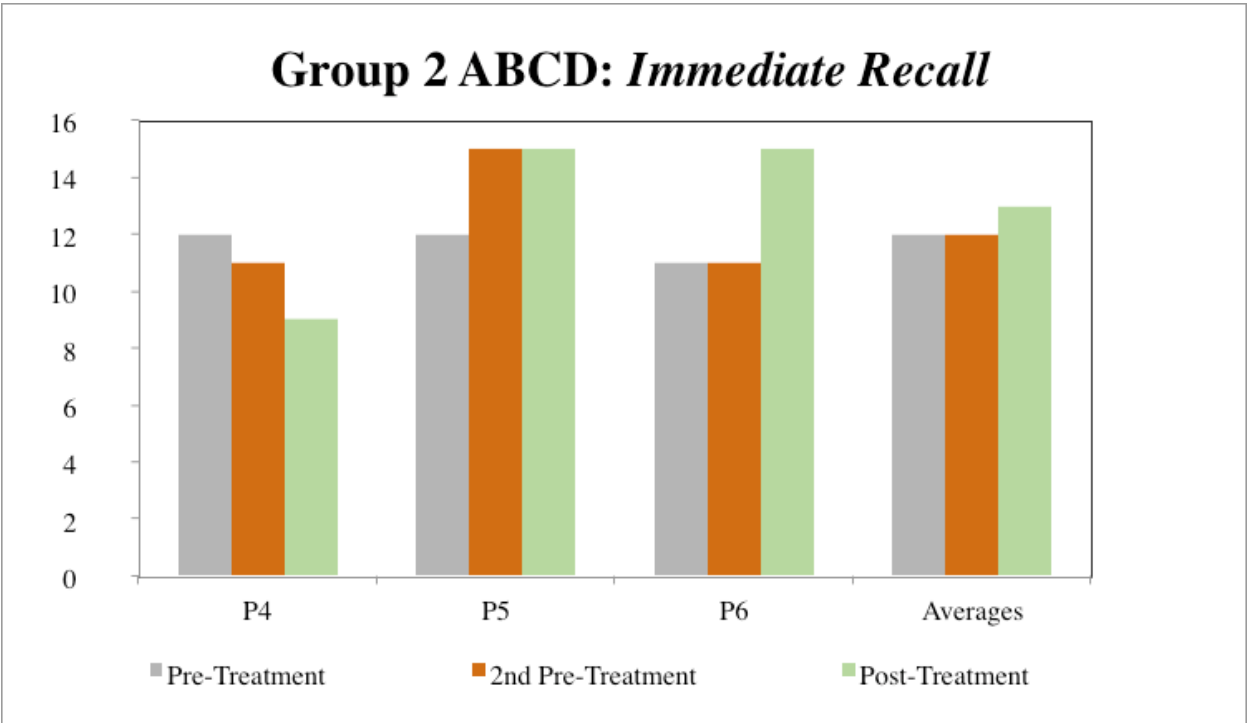
Figure 10. Group 2 participants' ABCD *Immediate-Recall* subtest scores.
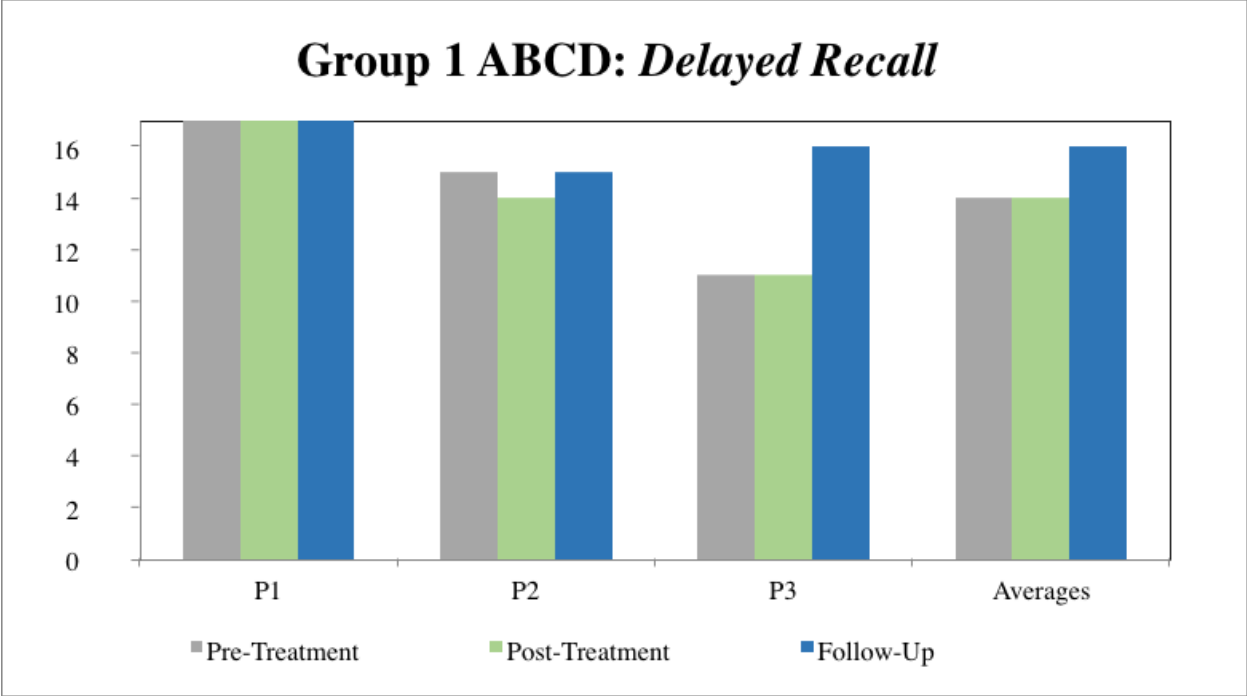
Figure 11. Group 1 participants' ABCD *Delayed-Recall* subtest scores.
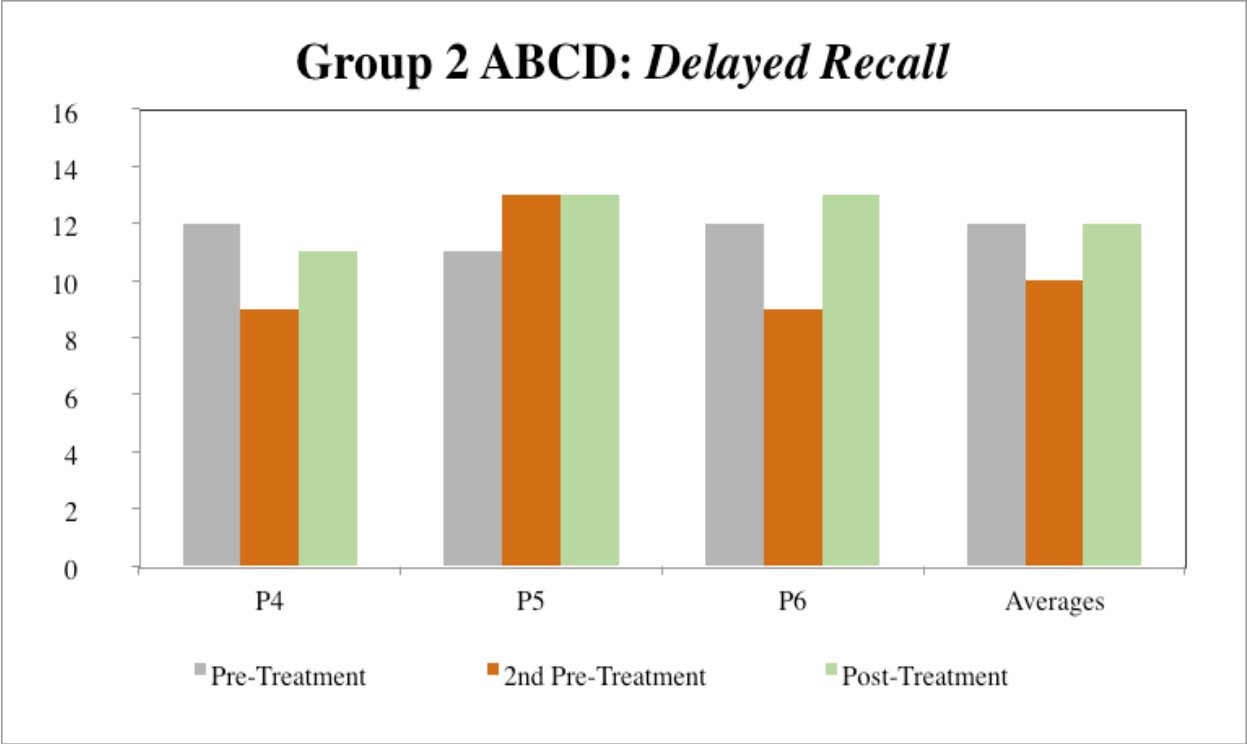
Figure 12. Group 2 participants' ABCD *Delayed-Recall* subtest scores.

Six-week Maintenance

The researcher also measured maintenance on all measures at six-weeks post-treatment for Group 1 participants (n = 3).

Functional EMA use and additional participant perceptions. Participant 1 and 2 continued to increase their Role Play Activity score using the same EMA; Participant 3 did not use an EMA during the follow-up assessment (refer to Table 8). The MMQ scores showed a decrease in feelings (MMQ-Contentment) (Figure 3) and strategies use (MMQ-Strategy) (Figure 1) as well as increase in mistakes made (MMQ-Ability) for Participant 1 and 2 (Figure 5). Participant 3 had an increase in feelings (MMQ-Contentment) and strategies use (MMQ-Strategy) and a decrease in mistakes made (MMQ-Ability) at six-weeks follow up.

Cognitive skills. Two participants' MoCA scores continued to increase (i.e., participant 1 increased from 25 to 27 and participant 3 increased from 28 to 29). Participant 2's score decreased by 2 points, but remained above a score of 25 (refer to Figure 7). The participants' ABCD *Immediate-Recall* and *Delayed-Recall* subtest scores increased or maintained. Participant 1 maintained the maximum score of 17 on both the ABCD *Immediate-Recall* and *Delayed-Recall* subtests. Participant 2 increased her score by one point on both subtests. Participant 3 increased her score by 3 points on the *Immediate-Recall* and 4 points on the *Delayed-Recall* subtest (refer to Figures 3 and 5).

Preferences

One week post-treatment all participants completed a questionnaire with 6 open-ended questions designed to elicit information about their EMA preferences within each category. Participants indicated which type of EMA they preferred from each category and their rationale for this selection. Regarding calendars, two participants preferred the paper daily view, because

it allowed for entering the most information. Four participants preferred the paper monthly view, because of the size and ability to plan ahead. All participants preferred the clip-on timer as it was simple and portable. For recording personal information, 2 participants preferred the memory wallet due to its small size. In contrast, 2 participants preferred the planner, because of its portability and sufficient space to write. Finally, the remaining 2 participants chose both the memory wallet and planner. The participants stated each type of EMA would be used for different tasks (e.g., emergency medical information would be kept in the memory wallet and detailed information about their doctors would be kept in the planner). No participants preferred iPad EMA version in any category (refer to Figure 13 for participant EMA preferences).
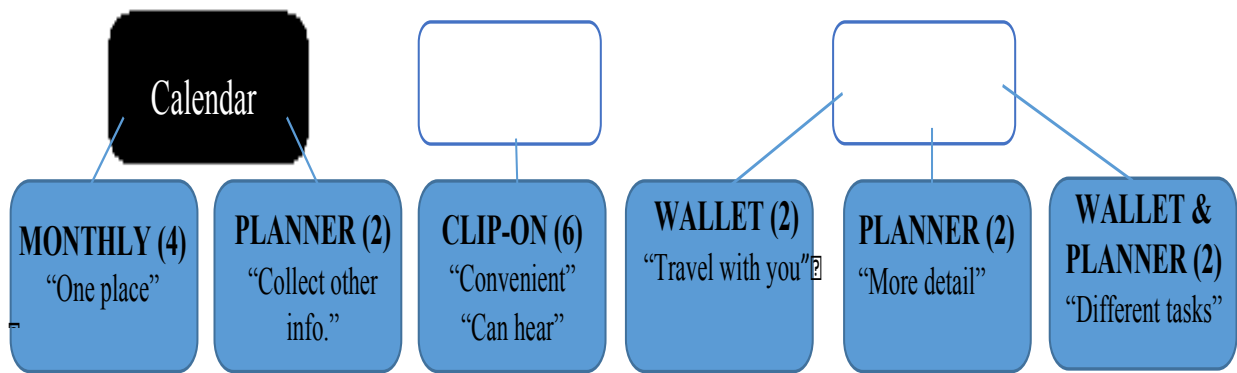
Figure 13. Participants' EMA Preferences

CHAPTER IV

Discussion

The current study examined the effects of group treatment on enhancing/increasing

external memory aid (EMA) use and cognitive abilities of individuals with MCI. A variety of

assessment tools examined the outcome measures during pre and post-treatment assessments.

The researcher also measured Group 1 participants' retention of these skills at six-weeks follow-

up. Furthermore, the researcher collected information about the participants' EMA preferences.

The data were analyzed across participants and between groups to identify the impact of

treatment across the variables. The researcher predicted that treatment would aid in increasing

functional EMA use and maintenance of cognitive skills. Maintenance of skills is important with

this population, due to the continued decline that occurs to 50% of the individuals with MCI

(Doty, 2007). Because of the intensity and home practice during the treatment, it was predicted

that Group 1 participants would retain functional EMA use after six-weeks without treatment.

Based on the previous research on EMA preferences for individuals with cognitive impairments

(Hart, Buchhofer, & Vaccaro, 2004) it was predicted participants would benefit from

personalized EMAs and using the EMAs in their home environment.

Functional EMA Use

    Role play activity. Overall, the results related to the primary outcome measure

suggested that group EMA treatment increased the participants' functional EMA use. The

current study examined functional memory performance and EMA use through the Role Play

Activity. Before treatment, four of six participants did not use any type of EMA during the Role

Play Activity. The participants, who did use EMAs before treatment, had a higher mean Role

Play Activity score (6) than participants who did not use EMAs during pre-treatment

assessments (3.5). These findings suggest that even without treatment EMAs support the participants' delayed recall of new information.

After treatment, all participants used EMAs during the Role Play Activity. All three Group 1 participants increased their score and used an EMA compared to Group 2 participants who did not increase their scores or use of EMAs during the period without treatment. These data may imply that the treatment resulted in improved EMA use. The Role Play Activity depicts a common activity of daily living, which is critical, because individuals with MCI often report having difficulties with complex activities of daily living (Constantiniduo et al., 2012). Therefore, an increase in EMA use and score on the Role Play Activity post-treatment, likely reflects a positive change in the participants' ability to participate in activities of daily living most affected by their memory impairments.

During the Role Play Activity, the participants could choose from a variety of EMAs (i.e., paper calendar, notepad, and iPad). While there were a variety of EMAs to choose from, the participants mostly used the notepad during pre and post-treatment assessments. Five participants used the notepad for the Role Play Activity (calendar or iPad) during the post-treatment assessment. Each participant used the notepad in a slightly different way. For example, participant 2 used the notepad to write only the most important details (e.g., "Dr. Gardella") and participant 5 used the notepad to attempt to write the voicemail information verbatim. The participants may have mostly selected the notepad because of their past experiences with its effectiveness or their level of comfort in using a notepad as compared to the other EMAs. Future research should examine the participants' rationale for choosing an EMA during the Role Play Activity task to help determine which EMAs clinicians might recommend during treatment.

Additionally, information about changes in EMA choice rationale may provide information about the effect of treatment that was not detected in the current study.

Only one participant tried to use the notes feature on the iPad after treatment. During treatment, she learned about the benefits and features of the notes application on the iPad through group practice and discussion. However, she was unable to use the iPad with the speed required to successfully complete the Role Play Activity and therefore received a lower score. In contrast, Oriana et al. (1993) found that participants with early dementia increased their success when using an electronic aid compared to a written list. The electronic aid used was a recording device and therefore the participants may have been more familiar using this type of EMA versus an iPad (Oriana et al., 1993). The recording device only has a power and recording button compared to the multiple features of an iPad. Therefore, an individual may be more familiar with the recording device due to the simplicity.

Importantly, the participant, in the current study, realized she was not appropriately collecting the information and switched to another type of EMA (i.e., writing on a notepad). Although only one participant switched EMA types during the activity, this example suggests another possible result of group EMA treatment. That is, failures during home practice and later discussion within the group may have allowed the participants to self-assess their use of EMAs and consider the importance of switching strategies mid-task. Researcher have found that individuals are most likely to use an EMA outside of treatment if they have encountered periods of failed strategy use (Sohlberg & Mateer, 2001). Therefore, future EMA treatment studies should examine the inclusion of real life experiences and instances of failed strategy use. Clinicians should continue to integrate multiple EMAs into treatments, and encourage discussion of failures and successes with each type of EMA.

MMQ-Strategy. In addition to the Role Play Activity, researcher examined participants' perceptions of functional EMA use through the MMQ-Strategy subtest. This subtest required participants to report their use of a large number of memory strategies, including EMAs. Post-intervention, both groups increased their mean score by four points. Additionally, greater changes were noted during treatment (Group 1) compared to a period of no treatment (Group 2). These changes, although minimal, support the positive impact of treatment on the participants' understanding and reported daily use of EMAs. Another MCI strategy treatment also found positive changes in the participants' MMQ-Strategy subtest scores (Kinsella et al., 2009). Specifically, Kinsella et al. (2009) found a mean increase of 10 points for their 22 participants compared to the current study, which found a mean increase of 4 points for six participants. The differences in the other study may account for the differences in performance. For example, the (Kinsella et al., 2009) intervention focused on multiple ways to enhance memory (e.g., external memory aids, face-name recall, and visual imagery). Bourgeois (2013) intervention involved multiple strategies and also the participants' increased their self-reported use of strategies following group MCI treatment. Although the current study's treatment only focused on one memory strategy (EMAs) and had a smaller number of participants, the participants still increased their self-reported use of strategies post intervention.

Within the MMQ-Strategy subtest were three questions that related to the EMAs trained in this intervention. Although the frequency of reported use varied across the EMAs, it is important to note that the participants were most familiar with using the calendar prior to treatment. This provides rationale for training the calendar first within the three categories of EMAs. Due to the high familiarity, the participants could use the calendar to assist with remembering to complete their home practice for the following sessions. Among the EMAs, the

participants were least familiar with using the timer. However, the participants all reported using a timer or alarm within the last two weeks on the MM-Contentment during post-treatment assessment. Therefore, the treatment introduced the participants to new ways in which to use common EMAs to compensate for their memory impairments.

Future studies may compare the relative benefits to memory strategy use from treatments that focus on a single strategy (i.e., EMAs) versus treatments that focus on a group of memory enhancing techniques. While the gains within the current study were minimal, given the progressive nature of the participants and the support in similar findings from previous studies, the improvements in EMA use during a structured activity and report of EMA use during functional activities highlight the benefits of group EMA intervention for individuals with MCI.

Participant Perceptions

In addition to strategy use, the MMQ provided information about the participants' feelings about their memory (MMQ-Contentment) and perceptions of mistakes made due to their memory impairments (MMQ-Ability). The current study's MMQ-Contentment subtest data showed an increase in the participants' positive feelings toward their memory after treatment. Participants in Group 1 mean increase related to feelings was two points while Group 2' second pre-treatment assessment score decreased by six points. This is similar to the data collected in Kinsella et al. (2009) study. The group that received intervention increased their mean score by 4 points compared to the mean scores in the waitlist group that decreased by one point during two-week follow-up assessment (Kinsella et al., 2009). In contrast, participants in Bourgeois study (2013) reported a decrease in positive feelings about their memory post-intervention. Similar to the current study, Bourgeois (2013) examined a group compensatory memory intervention for individuals with MCI. The difference between the studies is noted in the compensatory strategies

taught. Given the relatively small sample size in each study, future research is needed to determine how group intervention affects the participants' feelings about their memory.

Both Kinsella et al. (2009) and Bourgeois' (2013) studies included metacognitive intervention in their compensatory cognitive treatment. The current study did not include any tasks designed specifically to target the participants' metacognitive abilities or awareness of memory impairments. Given these differences, the findings related to participants' feelings were unexpected in the current study. Potentially, the structure of the treatment had an indirect positive impact on participants' feelings about their memory. Informal group treatment observations suggested that the group model facilitated natural discussions of the participants' feelings about their memory, although the intervention did not directly teach awareness of memory or coping strategies. Observations also suggest that the group dynamic allowed the participants to share positive ideas about integrating the intervention and support towards using the strategies. These findings propose that group therapy alone may have the same effect as including metacognitive intervention into treatment. In fact, group therapy with individuals with MCI may have a greater positive impact on the participants' feelings about their memory than interventions that include metacognitive sessions. Research has found that dementia groups make a positive emotional impact on the participants, because the group members are supportive and non-judgmental (Spector, Gardner, & Orrell, 2011).

Due to the mixed results on MMQ-Contentment subtest across MCI compensatory cognitive interventions, future research should further investigate the effects of various MCI treatments on individuals' reported feelings. Possible group versus individual dynamics during treatment or the structure of the intervention may impact the participants' feelings towards their memory.

MMQ-Contentment subtest information is important, because individuals' feelings about their memory may affect their performance on memory tasks. Additionally, memory treatments, that include any reflection on daily experience, may cause people to become more aware of their cognitive deficits and the possible progression of their impairment. Thus, it is important for clinicians and researcher to continually monitor the individuals' feelings throughout treatment. Longitudinal data about feelings people with MCI have about their memory is not currently available. This information is critical to developing an understanding of the effect of memory interventions in this population.

The MMQ-Ability subtest scores showed no difference in the participants' self-report of memory related mistakes after treatment. However, the researcher informally observed positive changes related to participant mistakes made due to memory during group discussions after home practice. The MMQ-Ability subtest asks participants about a variety of common everyday problems, but does not state if they have encountered this problem while using an EMA. A self-report tool that specifically inquires about the use of EMAs to avoid memory-related mistakes may more accurately reflected changes resulting from an EMA treatment than the MMQ subtests. For example, the MMQ-Ability asked the participants if they recently forgot to pay a bill, but did not specifically include statements about why the individual forgot or if they used strategies during these mistakes. Allowing the participants to explain why they forgot or if they used an EMA during the task, would provide precise information about the relationship between EMAs used and the participants' perceived mistakes. Future research should include information about using EMAs into the assessment of participant's memory related mistakes to better determine the impact of treatment.

Cognitive Skills

MoCA. Although the primary aim of the intervention was to provide instruction in the use of compensatory strategies, participants' cognitive skills were indirectly affected. That is, participants demonstrated a slight increase or maintenance in cognitive abilities during post-treatment assessments. These data should be interpreted with caution, however, because of the small sample size and relatively small change demonstrated. Prior to treatment, the participants' mean MoCA score was a 23, which is slightly below the cutoff score for MCI (i.e., below a 26). After treatment, five of the six participants scored at or above a 25, suggesting that the participants no longer met MCI inclusion criteria for the study.

Previous research by Bourgeois (2013) indicated a slight decrease in MoCA scores post-intervention, despite improvements in memory strategy use. Bourgeois' intervention (2013) focused on a variety of memory strategies (e.g., organization, verbal elaboration, and active observation) throughout the treatment sessions. However, the current study trained a single strategy (i.e., EMAs). The lack of data reported in Bourgeois (2013) study suggests that the intensity and repetitive design of the current single strategy study may be a possible explanation for the increase in cognitive skills noted.

The current study results are similar to the findings from the literature review of cognitive interventions completed by Li et al. (2011). The studies the researcher reviewed showed an increase in cognitive skills following cognitive intervention for individuals with MCI. It is important to note that of the studies reviewed, none used a single-strategy EMA treatment. Therefore, this is the first study to examine the impact of single-strategy, EMA, intervention on participants' cognitive skills. This resulted in the current treatment being the first to show a connection between instructional EMA use and an increase in cognitive skills. The intensity and

repetition throughout the current study's treatment could have possibly had an effect on the participants' cognitive skills, when comparing the intervention to similar studies.

Further analysis of individual MoCA item scores showed the greatest improvement in the delayed recall item, which is the most applicable subtest to the skills taught in treatment. Although the degree of change is minimal, the score on the delayed recall item of the MoCA increased for all participants. During this item, the researcher asked the participants to retrieve five words after a 20-minute delay. Post-treatment, the participants retrieved between four or five of the words. In addition to these quantitative gains, the researcher also noted that during pre-treatment assessment participants often stated "I don't know" and during post-treatment assessment they often guessed target items when they were unsure. This post-treatment change suggests that participants may have increased confidence in their memory retrieval skills post-intervention. The participants often guessed accurately and received increased scores on this section of the MoCA. Through informal observations of the group, discussions about the participants' memory, and an increase in overall memory ability awareness may have possibly impacted their cognitive skills. The group dynamic during treatment could have possibly increased the participants' confidence; because of the support and motivation the participants provided each other. Spector et al. (2011) also found that individuals with dementia who participated in group intervention had cognitive benefits. She found that one's confidence level often impacted an individual with Alzheimer's dementia's cognitive impairment. Therefore, the group dynamic in her study improved the participants' morale leading to a more attentive active mind (Spector et al., 2011). Similar to the Spector et al. (2011) study, the current study found that group treatment restored the participants' confidence and increased their attentiveness during more challenging tasks.

ABCD-subtest. The results for the ABCD-*Delayed Recall* subtest further supports the indirect relationship between EMA treatment and change in delayed recall skills. Specifically, Group 1's mean score of 14 was maintained after treatment while Group 2's mean score decreased by 2 points when reassessed after six-weeks without receiving treatment. The Group 1 maintenance of scores highlights a possible benefit from treatment. Both the MoCA and ABCD assessments' delayed recall sections provide support for an indirect relationship between single-strategy EMA intervention and positive effects on the participants' delayed recall skills. Future research should further explore the relationship between EMA intervention and delayed recall skills for individuals with MCI.

Retention of Skills

Participants in Group 1 were assessed at six-weeks post-intervention to analyze retention of skills after a period without treatment. Two of the three participants continued to use writing on a notepad as an EMA during the Role Play Activity and increased their score from a 6 at post-intervention to a 7 at follow-up assessment. One participant (participant 3) did not use an EMA and her score decreased by 2.5 points during follow-up from a 6 at post-treatment assessment. Potentially, this participant relied on the group treatment sessions to assist as a reminder to use the EMAs. In examining the MMQ-Strategy subtest data, two participants (participant 1 and 2) decreased their scores and one participant increased her score (participant 3). Due to the discrepancies in participant 3's EMA use and self-report score of strategy use, it is possible that the participant may have poor self-awareness. It is also possible that participant 3 used strategies following intervention in different ways that could not be measured through the Role Play Activity.

These data of retention of functional EMA use is similar to the results found by Kinsella et al. (2009). The participants' mean also decreased from post-treatment to the follow-up assessment, which occurred four months after treatment ended (Kinsella et al., 2009). Both the current study and Kinsella et al. (2009) study found inconsistent participant scores, but an overall mean decrease of participants' reported strategy use during follow-up assessments. Therefore, when some participants are not receiving treatment they perceive a decrease in daily strategy use. These data suggest that some individuals would benefit from on-going treatment or continued reminder sessions once intervention is complete. Future research should include review sessions following intervention to maintain strategy use and to promote continued EMA use.

It is not only important to have continued review sessions post-treatment, but the review sessions should be completed in a group. Anecdotal reports from participants and informal observations from the current group therapy intervention suggest that, the format of the current study's intervention may be particularly important for encouraging strategy use. For example, the participants often wanted to share with one another how they used the EMA throughout the week. Similar group dementia treatments (Spector et al., 2011) found that participants reported that group treatment provided a sense of achievement, community and excitement to share and discuss with group members. These informal observations of group therapy model support the benefits of using this approach in teaching EMAs and future research should include the group model during post-intervention review sessions.

Informal observations of the group model also supported the impact of the model on participants' perceptions of their memory beyond the treatment period. Specifically, at six-weeks follow-up, the participants reported decreased feelings about their memory according the MMQ-Contentment subtest. In addition, previous research found that the time post-intervention

negatively impacted the participants' feelings towards their memory (Kinsella et al., 2009). For example, at two-weeks follow-up, the participants MMQ-Contentment scores increased, but decreased at four-months follow-up (Kinsella et al., 2009). Similar to the post-treatment MMQ-Ability subtest data, the current study's participants' scores were mixed at 6-weeks follow-up assessment. Therefore, no connection can be made between treatment and the participants' self-report of memory mistakes.

Overall, the treatment indirectly affected the participants' retention of gains in cognitive skills six-weeks post-intervention. Specifically, the participants' maintained their mean MoCA score at six-weeks follow-up assessment. The *Immediate-Recall* and *Delayed-Recall* ABCD subtest mean scores both increased by two points during follow-up assessments from 14 to 16. To date, no other study has examined this type of cognitive intervention (e.g., group treatment for EMA) on retention of cognitive skills. Due to the small number of participants and limited supporting research, the results related to cognitive skills should be interpreted with caution. Researcher and clinicians need future studies to examine the progression of cognitive decline in individuals with MCI, so that we can better understand the value of our interventions. Future research should compare the retention of one's cognitive abilities, using a variety of sensitive measures, after a compensatory cognitive intervention to individuals without treatment.

EMA Preferences

Calendars. Individuals reported their preferences within each category of EMA through an open ended post-treatment questionnaire. Within the calendar category, four participants preferred the monthly version and two participants preferred the planner version. Those who chose the monthly version reported enjoying seeing everything in one place. That is, they liked seeing all the information for a single month together on the same page. However, some

participants reported choosing the planner due to the large amount of space to expand and write details. Given the variability in preferences, it is important to provide people with MCI many opportunities to trial and practice multiple types of EMAs within a category. Although the participants did not have a large difference in age and lived in the same apartment center, differences existed amongst their preferences to record and view information they needed to remember. Until the field gains a better understand of how preferences affect EMA use, clinicians should allow the individual to choose the type of EMA to ensure maximum success.

Timers. All six participants stated a preference for the clip-on version within the timer category. In contrast to the calendar preferences, the participants all agreed upon this type of EMA. Participants reported choosing this EMA due to the convenience, size, and volume. In comparing the clip-on timer to the other types within this category, the distinguishing feature is the ability to wear this timer. The participants found the iPad and manual version of the timer to be unreliable and difficult to hear. The participants' changes in hearing, due to normal aging, impacted their ability to hear the iPad and manual timer when it was out of reaching distance. Although the iPad and manual timer were portable, the clip-on timer decreased the participants' reliance on their memory to remember carry the EMA with them as they move around. This indicates the importance of choosing a timer that is portable and easy to remember, to ensure that the individual can hear the aid and have it available when needed. It is important that the EMA decreases rather than increases the individuals' memory burden. TBI research has found that EMAs are successful with individuals because the cognitive load is reduced in comparison to internal memory aids (e.g., mnemonics) (Zencius, Wesolowski, & Burke, 1990). Individuals with MCI also have relatively intact procedural memory skills, as do individuals with TB1, and therefore may successful learn the procedures to operate EMAs (Constantinidou et al., 2012).

Personal information. Within the personal information category, participants chose the memory wallet and/or the planner. Two participants reported choosing only the wallet version was due to its portability. The participants reported feeling safe having important personal information with them at all times. Individuals with MCI often live independently and complete normal activities of daily living (Constantiniduo et al., 2012; Doty, 2007). They may be independently traveling outside of their home throughout the day. Therefore, EMAs need to be useful in a variety of settings, outside of their home, to allow for these individuals to maximize their successful participation in activities of daily living. The participants could also conveniently travel with the planner and reported choosing this aid due to the large amount of space to write.

A unique feature of the current study is that not only did the participants' complete activities of daily living independently, but also lived alone in the retirement apartment center. The participants in similar MCI studies (Bourgeois, 2013; Kinsella et al., 2009) reported completing activities of daily living independently, but did not live alone. In addition, the individual they lived with participated or closely associated with, participated in the intervention. Since the participants of the current study lived alone, the participants informally reported needing EMAs more because they were solely responsible for their own activities of daily living (e.g., appointments, meals and finances). Having the sole responsibility enhances the need for choosing EMAs that are appropriate and most efficient to complete complex tasks.

Not all participants chose one type of EMA within the personal information category. Two participants chose both the memory wallet and planner, but differentiated between when each type would be used. This supports the intervention design of two non-congruent sessions dedicated to each EMA category during the treatment. If the participants were only given one

opportunity to explore a category of EMAs, it is possible that only one type would have been selected based on familiarity or comfort level. For example, the participants were least familiar and most hesitant towards using the iPad. By having the participants use the iPad across multiple sessions, they learned about the advantages and disadvantages of using a high-tech aid. Although the participants did not prefer the iPad version, during treatment they identified several positive features of the aid. Therefore, clinicians should provide individuals with MCI with multiple opportunities to practice with each type of EMA. The two sessions dedicated to one category, allowed the participants to explore all of the types of EMAs and use them outside of the intervention sessions. These data also suggest that each individual with MCI may choose to use more than one type of EMA within a single category and therefore should not only be given one type to use.

Comparison to similar populations. Researcher and clinicians generally agree that consideration of individuals' goals, preferences, and environmental factors results in the most effective EMA use (Scherer, 2005). To date, limited research exists about EMA preferences of individuals with MCI. As such, researcher and clinicians may try to glean some information from the preferences of individuals with a variety diagnoses with comparable cognitive deficits.

Traumatic brain injury (TBI) is one population that also experiences memory impairments. Most of the research related to TBI and EMA preferences evaluated electronic memory aids. For example, the study by Hart, Buchhofer and Vaccaro (2004), found that the 80 participants with TBI, had a high interest in learning new electronic memory aids (80%) and a high comfort level with technology (78%). In contrast, no participants in the current study chose the electronic version (i.e., iPad) from any EMA category. Informal observations during group treatment sessions indicate that the individuals were less familiar with the iPad than the other

types of EMA. Only one of the six participants reported ever using an iPad or touch screen device prior to treatment. In addition, participants were most hesitant toward using the iPad throughout the sessions. Although individuals with TBI and MCI both have cognitive deficits, based on these two studies it appears their preferences toward electronic EMAs are not similar.

Reasons for the differences between TBI and MCI populations may relate to the age of the individuals in the studies. For example, the mean age of the participants in the Hart, Buchhofer and Vaccaro (2004) study was 31.5 years (Range = 17 to 70 years). The mean age of the participants in the current study was 82 years (Range = 72 to 88 years). Due to the age of the individuals in the current study, the participants may have been less familiar with using an iPad as compared to the young adults with TBI. Future research should continue to investigate EMA preferences of individuals with MCI. TBI research may not be helpful in determining the success or preferences for people with MCI. Future research should investigate interventions to teach electronic EMAs to individuals with MCI who motivated to use high-tech aids. In addition, the participants' basic iPad familiarity was not assessed prior to treatment. Therefore, a large amount of intervention was spent familiarizing the participants with basic operation features of the iPad rather than the EMA component. Future research, when using an iPad as an EMA, should assess the participant's skills prior to treatment and provide a basic training of operation features before EMA intervention.

Limitations

Results of this study provide support for group EMA treatment for individuals with MCI. Only six individuals participated in the study, therefore the generalization of the results to all people with MCI is limited. The study included a small sample size that while appropriate for an exploratory study, limits the conclusions that can be drawn. Additionally, all the participants

were woman despite several men attending the informational session about the treatment. Future research should incorporate men and women into group treatment as well as individuals from multiple age groups and cultural backgrounds. These variables may also affect the dynamic and interactions within groups and should be investigated in future studies with familiar and unfamiliar group members.

The participants completed a self-report assessment (MMQ) to provide the researcher with information about their feelings about their memory, ability to complete cognitively demanding tasks, and daily strategy use. Using a self-report tool to measure daily activity changes is a limitation due to reliability The researcher did not directly measure changes in the participants' daily activities post-intervention so little is known about how participants performed outside of the structured experimental tasks. In addition, although the MMQ was intended to be completed independently by participants, the researcher needed to explain the scoring system and read many of the items to the participants because of the small font size. In the future, an ecologically valid assessment should be used to assess the participants' daily activities and EMA use. A video-recording system in the individual's home may provide the most realistic measure of functional EMA use in the participants' daily routine.

The current study's inclusion criterion for MCI is a limitation, because the participants did not have a formal diagnosis of MCI from a physician. Rather, than a formal MCI diagnosis, participants had to meet the inclusion criteria (i.e., score below a 26 on the MoCA, live independently, self-report a decline in memory). Due to the exploratory nature of this study, the researcher conducted limited cognitive testing (MoCA, ABCD-subtests) and did not seek a physician's diagnosis to include participants. Although limited the testing was similar to those a clinician may use to evaluate individuals experiencing a reported decline in memory skills but

still living independently. Specifically, the MoCA has been determined to provide greater specificity for the diagnosis of mild cognitive impairments than other frequently used cognitive assessments (i.e., Mini-Mental State Examination) (Hoops et al., 2009). Future research should investigate a more complete view of the participants' cognitive abilities. A more comprehensive cognitive picture may help researcher better determine the effect of treatment on participants cognitive skills.

Another cognitive limitation is the progressive nature of the impairment. Although this study showed change or maintenance of participants' cognitive skills following intervention, these results are difficult to interpret. Specifically, limited research exists on the rate of cognitive decline in individuals with MCI. Specifically, about 50% of individuals with MCI will progress to a dementia diagnosis; the rate of the decline is unknown (Doty, 2007). Without specific data on the rate of decline, the researcher of the current study interpreted the maintenance of the participants' skills to be a positive outcome. Research on the rate of progression, will allow researcher to best measure the relationship between the treatment and participants' cognitive skills.

Future Research

Future research should examine the effect of the group intervention versus individual intervention with people with MCI. A variety of group treatment models are available for individuals with MCI. For example, the number of strategies taught can differ and the inclusion/exclusion of a proxy in the treatment (Kinsella et al., 2009 & Bourgeois, 2013). It is important to analyze if all types group treatments have the same affect and if individual treatment provides the participant with the same or greater support and motivation to use EMAs.

Within the limited studies on MCI treatment, this study provides a unique contribution relative to an increase in participants' cognitive skills post-treatment. Although the findings were positive, the degree of change across post-treatment assessments was small. This data was also difficult to interpret without knowledge of the expected cognitive decline of participants. Future research should further examine the relationship between EMA treatment and cognitive skills in individuals with MCI to determine if intervention involving a compensatory strategy may also facilitate some restoration of skills.

Positive changes were also noted with functional EMA use. Amongst the three categories of EMAs taught to the participants, every type of EMA was given to the participants to use during home practice except for the iPad. This difference in access to home practice with the aids may have resulted in the differences in use and preferences related to high tech EMAs. Future research should allow the individuals to use the iPads during the home practice portion of the intervention.

The current study was one of only studies to look at retention of EMA use and cognitive skills after treatment ended. Studies that examine long-term retention (longer than the 6 weeks in the current study) are needed. Additionally, studies examining retention may also consider evaluating different approaches to increase retention such as reminder sessions or phone calls.

Conclusions

This preliminary study employed a small sample size to describe findings from an innovative evidence-based, group treatment for EMA use in people with MCI. Positive findings suggest that individuals with MCI can learn to use EMAs and they report that EMAs positively impact their daily life. Additionally, group EMA treatment resulted in minimal gains in cognitive

skills. Future research should the impact of various types of EMA treatments on use of aids in

daily life and changes in cognitive skills.

References

Bayles, K. A., & Tomoeda, C. K. (1993). *Arizona Battery for Communication Disorders of Dementia*. Tucson, AZ: Canyonlands Publishing.

Bourgeois, M.S. (2013). Therapy techniques for mild cognitive impairment. *Perspectives on Neurophysiology and Neurogenic Speech and Language Disorders, 23*(1)*,* 23-34.

Bourgeois, M. S., Camp, C., Rose, M., White, B., Malone, M., Carr, J., & Rovine, M. (2003). A comparison of training strategies to enhance use of external aids by persons with dementia. *Journal of Communication Disorders, 36*(5)*,* 361-378.

Bourgeois, M. S., Dijkstra, K., Burgio, L., & Allen-Burge, R. (2001). Memory aids as an augmentative and alternative communication strategy for nursing home residents with dementia. *AAC Augmentative and Alternative Communication*, *17,* 196-209.

Cicerone, K. D., Dahlberg, C., Kalmar, K., Langenbahn, D. M., Malec, J. F., Bergquist, T. F., ... & Morse, P. A. (2000). Evidence-based cognitive rehabilitation: recommendations for clinical practice. *Archives of Physical Medicine and Rehabilitation, 81*(12), 1596-1615.

Chang, C., Hinze, A., Bowen, J. and Starkey, N. (2014, November). Designing a mobile augmented memory system for people with traumatic brain injuries. Paper presented at the Fifth IEEE Conference on Cognitive Infocommunications (CogInfoCom 2014), Vietri Sul Mare, Italy (pp. 13-18).

Constantinidou, F., Wertheimer, J. C., Tsanadis, J., Evans, C., & Paul, D. R. (2012). Assessment of executive functioning in brain injury: Collaboration between speech-language pathology and neuropsychology for an integrative neuropsychological perspective. *Brain Injury, 26*(13-14), 1549-1563.

Donaghy, S., & Williams, W. (1998). A new protocol for training severely impaired patients in the usage of memory journals. *Brain Injury, 12*(12), 1061-1076.

Doty, L. (2007). Mild cognitive impairment. Retrieved from

    http://alzonline.phhp.ufl.edu/en/reading/MCIArticle.pdf

Evans, J. J., Wilson, B. A., Needham, P., & Brentnall, S. (2003). Who makes good use of

    memory aids? Results of a survey of people with acquired brain injury. *Journal of the*

    International Neuropsychological Society, 9(6), 925-935.

Fish, J., Manly, T., Emslie, H., Evans, J. J., & Wilson, B. A. (2008). Compensatory strategies for

    acquired disorders of memory and planning: Differential effects of a paging system for

    patients with brain injury of traumatic versus cerebrovascular aetiology. *Journal of*

    Neurology, Neurosurgery & Psychiatry, 79(8), 930-935.

Fluharty, G. & Priddy, D. (1993). Methods of increasing client acceptance of a memory book.

    Brain Injury, 7(1), 85-88.

Garrett, K. L., & Yorkston, K. M. (1997). Assistive communication technology for elders with

    cognitive and language disabilities. In Rosemary Lubinski & D. Jeffery Higginbotham

    (Eds.), *Communication Technologies for the Elderly: Vision, Hearing and Speech* (pp.

    203-234). San Diego, CA: Singular Publishing Group.

Gillespie, A., Best, C., & O'Neill, B. (2012). Cognitive function and assistive technology for

    cognition: A systematic review. *Journal of the International Neuropsychological Society,*

    18(1)*,* 1-19.

Greenaway, M.C., Duncan, N.L., & Smith, G.E. (2012). The memory support system for mild

    cognitive impairment: randomized trial of a cognitive rehabilitation intervention.

    International Journal of Geriatric Psychiatry, 28, 402-409.

Gummesson, C., Atroshi, I., & Ekdahl, C. (2003). The disabilities of the arm, shoulder and hand

    (DASH) outcome questionnaire: longitudinal construct validity and measuring self-rated

health change after surgery. *BMC Musculoskeletal Disorders*, *4*(1), 1.

Hart, T., Buchhofer, R., & Vaccaro, M. (2004). Portable electronic devices as memory and

organizational aids after traumatic brain injury: A consumer survey study. *Journal of*

Head Trauma Rehabilitation, *19*, 351-365.

Hersh, N. A., & Treadgold, L. G. (1994). Neuropage: The rehabilitation of memory dysfunction

by prosthetic memory and cueing. *NeuroRehabilitation, 4*(3)*,* 187-197.

Hoops, S., Nazem, S., Siderowf, A. D., Duda, J. E., Xie, S. X., Stern, M. B., & Weintraub, D.

(2009). Validity of the MoCA and MMSE in the detection of MCI and dementia in

Parkinson disease. *Neurology*, *73*(21), 1738–1745.

Kinsella, G.J., Mullaly, E., Rand, E., Ong, B., Burton, C., Price, S., ... Storey, E. (2009). Early

intervention for mild cognitive impairment: a randomized control trial. *Journal of*

Neurology, Neurosurgery, and Psychiatry, 80, 730-736.

Kurtz, L. F. (1997). *Self-help and support groups: A handbook for practitioners* (Vol. 34).

Thousand Oaks, California: Sage Publications.

Li, H., Li, J., Li, N., Li, B., Wang, P., & Zhou, T. (2011). Cognitive intervention for persons with

mild cognitive impairment: A meta-analysis. *Ageing Research Reviews, 10*(2), 285-296.

Luterman, D. (1996). *Counseling persons with communication disorders and their families* (3rd

ed.). Austin, TX: Pro-Ed.

Mahendra, N. (2014). Dementia. In M.L. Kimbarow (Ed.), *Cognitive communication disorders*

(p. 198). San Diego, CA: Plural.

Marshall, R. (1993). Problem-focused group therapy for mild aphasic clients. *American Journal*

of Speech-Language Pathology, 2, 31-37.

Nasreddine, Z. S., Phillips, N. A., Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., ... &

Chertkow, H. (2005). The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society, 53*(4)*, 695-699.

Oriani, M., Moniz-Cook, E., Binetti, G., Zanieri, G., Frisoni, B., Geroldi, C., …Zanetti, O. (2003). An electronic memory aid to support prospective memory in patients in the early stages of Alzheimer's discease: a pilot study. *Aging and Mental Health, 7*(1), 22-27.

Panza, F., D'Introno, A., Colacicco, A.M., Capurso, C., Del Parigi, A., Caselli, R.J., ... Solfrizzi, V. (2005). Current epidemiology of mild cognitive impairment and other predementia syndromes. *American Journal of Geriatric Psychiatry, 13*(8)*, 633-644.

Petersen, R. C. (2004). Mild cognitive impairment as a diagnostic entity. *Journal of Internal Medicine, 256*(3), 183-194.

Scherer, M. J. (2005). Assessing the benefits of using assistive technologies and other support for thinking, remembering, and learning. *Disability and Rehabilitation, 27*, 731-739.

Sohlberg, M.M., & Mateer, C.A. (1989). *Introduction to cognitive rehabilitation, theory and practice.* New York, NY: Guilford Press.

Sohlberg, M. M., & Mateer, C. A. (Eds.). (2001). *Cognitive rehabilitation: An integrative neuropsychological approach.* New York, NY: Guilford Press.

Spector, A., Gardner, C., & Orrell, M. (2011). The impact of Cognitive Stimulation Therapy groups on people with dementia: Views from participants, their carers and group facilitators. *Aging & Mental Health, 15*(8), 945-949.

Troyer, A.K., & Rich, J.B. (2002). Psychometric properties of a new metamemory questionnaire for older adults. *Journal of Gerontology Series B: Psychological sciences and social sciences, 57*(1), 19-27.

Wilson B, Emslie H, Quirk K, & Evans J. (2001). Reducing everyday memory and

planning problems by means of a paging system: a randomised control crossover study.

Journal of Neurology, Neurosurgery, and Psychiatry, 70(4), 477-482.

Zencius, A. Wesolowski, M., & Burke, W. (1990). A comparison of four memory strategies with

traumatically brain-injured clients. *Brain Injury, 4*(1), 33-38.

Appendix A

Demographic Form

Participant ID: _____ Date of Testing: _____

Date of Birth: _____   Age: _____

Gender: ____Male   ____ Female

Highest Year of Education:_____   Race/Ethnicity:_____

Previous/Current Occupation:_____

Living Situation:

  _____   Independent Living

  _____   Living with a spouse or caregiver

If you check any of the below options, please indicate why:

  _____   Assisted Living Facility:

  _____   Nursing Home Facility:

  _____   Memory Unit:

What daily activities do you need assistance with and why? (e.g. cooking, cleaning, bathing, and

dressing)?_____

	Score	Description/Comments
MoCA	_____ /30	≥ 26 WNL <26 MCI or AD
Vision Screening	_____ /5	
Hearing Screening	Pass/fail	
ABCD Story Retell*		
MMQ-Ability*		
MMQ- Contentment*		
MMQ- Reasoning*		
Motor screening questions 1-3 below		must all be yes

Estimated Date of MCI Onset: _____   Estimated Time post onset (months): _____

MCI diagnosis description:_____

Self-Reported Vision Problems: _____ Yes _____ No   Type of Problem:

_____

Corrected?   _____ Yes   _____ No

Screening/Testing Procedures to complete with each participant
*not used to determine study eligibility

Pre-treatment Questions

1. Do you have difficulty writing?

2. Are you able to turn a key?

3. Would you have trouble with pushing a doorbell?

4. What memory problems do you notice most often?

5. How do these problems affect your social life?

6. How do these problems affect your work and volunteer activities?

Vision Screening

Please circle your name in each of the five rows.

Alyssa   Sarah   Dianne   Katie

Sarah   Dianne   Alyssa   Katie

Katie   Sarah   Dianne   Alyssa

Dianne   Alyssa   Katie   Sarah

Sarah   Katie   Alyssa   Dianne

Post-Treatment Questionnaire

1. Which external aid did you choose to work on within the calendars category?

2. Why did you choose that aid?

3. Which external aid did you choose to work on within the timer category?

4. Why did you choose that aid?

5. Which external aid did you choose to work on within the personal information category?

6. Why did you choose that aid?

Role Play Activity

Role Play Activity Scoring Sheet

For column two and three use a (+) to indicate an accurate response or use of EMA. Use a (-) to indicate an incorrect response or no use of EMA.

Questions	Accuracy of Response (0-7)
1	
2	
3	
4	
5	
6	
7	

Questions	Instance and Type of EMA Use
1	
2	
3	
4	
5	
6	
7	

External Memory Aid Pictures

Calendars

A. Planner

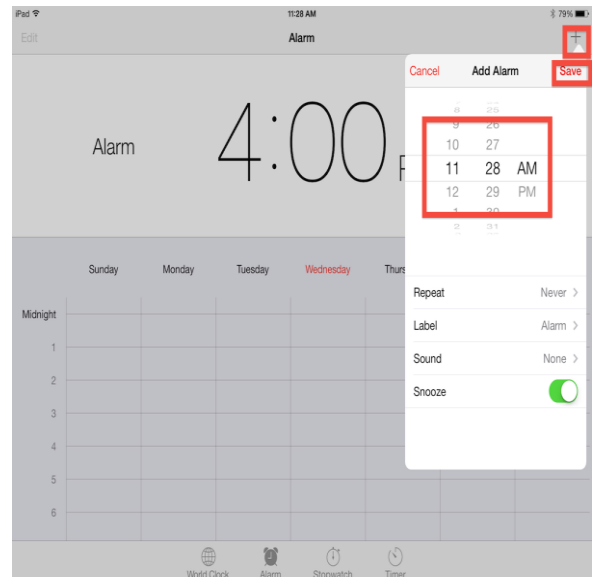B. Paper Monthly

C. iPad Daily and Monthly

Timers

A. Manual

B. Clip-On

C. Stopwatch

D. iPad Alarm and Timer

Personal Information

A. Memory Wallet

B. Planner

C. iPad Notes

CALENDARS

Weekly

Monthly

Electronic

WHY USE THEM
- Don't forget
- Clear your head
- Keep you organized
- Schedule for the day
- Don't overbook yourself
- Establish routine

CUSTOMIZABLE
- Color coded
- Symbols
- Abbreviations
- Font size
- Multiple views

Examples of when to use
- Birthdays, holidays and special occasions
- Appointments
- Payment Schedules
- Medication Schedules
- Your Daily Schedule

Timers

iPad Timer

Watch Timer

Manual Timer

Why use?

- Increase Productivity
- Allow for short breaks
- Prioritize and Accommodate for event times
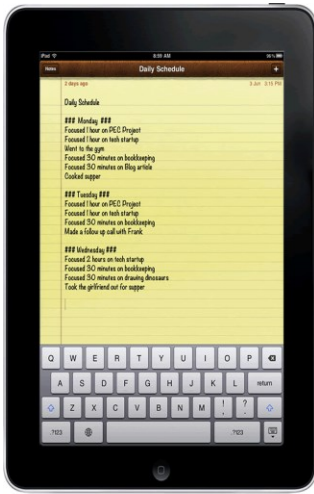- Reminds you when to do something

Customizable

- Count down
- Count up
- Loudness and Sound
- Vibration
- Provide label
- Color
- Repetition

Examples of when to use

- When ironing the clothes (allot for 20 mins)
- If you have to leave the house at 3:00
- Allotting for a TV break in your day
- To remind you to do the laundry

Personal Information

iPad Notebook

Memory Wallet

Lists

Why use?

- To remind you of important information
- To increase your comfort level
- To aid in accuracy of information
- To increase efficiency
- To help establish social closeness

Customizable

- Colors
- Categories
- Multiple pages
- Numbers
- Cross outs
- Highlighter

Examples of when to use

- Medical Information
- Passwords
- Family/Friends Information
- Phone Numbers
- To Do Lists

Calendars Home Practice

Tomorrow sit down and think of at least five things to write down in your calendar for the week. Examples of things to write down: appointments, dinners, parties, and reminders. Make sure to include the time and location. Use colors or larger font to customize your calendar. Bring in your calendar in the next session.

Look at your calendar every morning when you wake up: to see what your schedule for the day is and to see if you need to include more information

Use the calendar spontaneously during the week. For example, if a friend makes dinner plans with you immediately write it in your calendar. Write below what you wrote in your calendar, when you wrote it, and if you looked at it throughout the week

Timers Home Practice

Of the six activities below, choose five to complete this week. Use as many different timers (as available to you) to complete the home practice. Remember to personalize it. After completing the activity, write about the advantages and disadvantages and if the aid helped. Remember this information will be shared at the start of the next session.

- Use a timer to schedule in a break for your day (e.g., watching TV, taking a nap)
- Use a timer to complete your laundry (remember use it during each step)
- Use a timer to remind you to be somewhere at a certain time
- Use a timer to help you remember when to take your medications
- Use a timer to help you remain focused on a task (e.g., cleaning or cooking)

Personal Information Home Practice

Of the six activities below, choose five to complete this week. Use as many different personal information aids (as available to you) to complete the home practice. Remember to customize the aid and to share how you customized it. After completing the activity, write about the advantages and disadvantages and if the aid helped. Remember this information will be shared at the start of the next session.

- **Write down all of the medications you take and when you take them**
- **Write a to-do list and cross out after completion**
- **Write down five passwords you have**
- **Write down the names of unfamiliar individuals (e.g., niece's boyfriend)**
- **Write down your doctor's information**
- **Write down important dates (e.g., anniversaries and birthdays)**