Effects of External Memory Aid Assessment and Treatment on Everyday Task Performance of Individuals with Mild Neurocognitive Disorder

Alyssa M. Lanzi
University of South Florida, alanzi200@yahoo.com

Follow this and additional works at: https://scholarcommons.usf.edu/etd

Part of the Speech and Hearing Science Commons

Scholar Commons Citation
Effects of External Memory Aid Assessment and Treatment on Everyday Task Performance of
Individuals with Mild Neurocognitive Disorder

by

Alyssa M. Lanzi

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Department of Communication Sciences and Disorders
College of Behavioral and Community Sciences
University of South Florida

Major Professor: Michelle Bourgeois, Ph.D., CCC-SLP
Howard Goldstein Ph.D., CCC-SLP
Jacqueline Hinckley, Ph.D., CCC-SLP
Jessica Brown, Ph.D., CCC-SLP
Robert Dedrick, Ph.D.

Date of Approval:
March 26, 2019

Keywords: compensatory strategies, functional behavior, dementia, cognitive impairment

Copyright © 2019, Alyssa M. Lanzi
DEDICATION

To the hundreds of older adults and families who taught me countless life lessons, reminded me to always smile, dream big, and the importance of communication; To the LivForYou organization; and To the older adults in my personal life who I will always aspire to be; this work is affectionately dedicated.
ACKNOWLEDGMENTS

To my parents who taught me the importance of hard work, family, and education; thank you for always being the best role models. To my family and friends, who continually offer support, patience, and love; thank you for the phone calls, visits, laughs, and Disney trips that allowed me to smile throughout my journey. To Conor, thanks for always believing in me.

To the Duquesne University Speech-Language Pathology faculty and staff, thank you for providing me with the foundational knowledge and work ethic to complete this work. Special thanks, to Dr. Kimelman for allowing me to use the University as a resource throughout my dissertation.

To Dr. Wallace who continued to be a mentor, support system, and friend throughout my dissertation; without you, none of this would be possible. Thank you for always pushing me to new heights and inspiring me to change the field, as you have.

To my dissertation mentor Dr. Bourgeois, thank you for the guidance, support, and smiles along the way. Your work has changed the lives of so many individuals and I can only dream to contribute such influential work like your own. To Dr. Goldstein, thank you for challenging my thoughts and pushing me to always think big. Thanks for the supportive mentoring.

To Dr. Hinckley and Dr. Brown, thank you for the constant support and guidance throughout this journey. A special thanks to Dr. Dedrick who helped me numerous times with my measurement questions and took the time to explain difficult concepts. To the Duquesne University and University of South Florida students, thank you for your hard work and dedication throughout these projects.

Finally, to the participants, thank you for your time and energy. The study would not be possible without each participant and their dedication to the study.
TABLE OF CONTENTS

List of Tables .................................................................................................................................. v

List of Figures ................................................................................................................................ vi

Abstract ......................................................................................................................................... vii

Chapter One: Introduction .............................................................................................................. 1
1.1 References .................................................................................................................................. 3

Chapter Two: Group External Memory Aid Treatment for Mild Cognitive Impairment .......... 5
2.1 Introduction ................................................................................................................................ 5
   Mild Cognitive Impairment ........................................................................................................ 5
   External Memory Aids ................................................................................................................ 6
   Research Questions .................................................................................................................... 9
2.2 Methods ..................................................................................................................................... 9
   Participants ............................................................................................................................... 9
   Materials .................................................................................................................................. 10
      Screening ............................................................................................................................... 10
      Dependent Measures .......................................................................................................... 11
      Treatment Measures .......................................................................................................... 12
2.3 Design ..................................................................................................................................... 13
   Procedures ................................................................................................................................. 14
      Pre-Treatment ....................................................................................................................... 14
      Treatment .............................................................................................................................. 14
         Introduction of the treatment approach ........................................................................ 15
         Introduction of new category of external aids ............................................................... 15
         Functional practice ......................................................................................................... 15
         Explanation of home practice with new aids ................................................................. 16
         Review of home practice activity .................................................................................... 16
      Post-Treatment ..................................................................................................................... 16
      Follow-Up ............................................................................................................................. 16
   Data Analysis and Reliability ................................................................................................. 17
2.4 Results ..................................................................................................................................... 18
   Functional External Memory Aid Use ................................................................................... 18
      Role Play Activity ............................................................................................................... 18
      MMQ-Strategy .................................................................................................................... 19
   Cognitive Skills ....................................................................................................................... 21
      Montreal Cognitive Assessment ......................................................................................... 21
      ABCD-Subtests ..................................................................................................................... 22
2.5 Discussion ............................................................................................................................... 23
   Functional EMA Use .............................................................................................................. 23
   Role Play Activity .............................................................................................................. 23
   MMQ-Strategy ...................................................................................................................... 24
   Cognitive Skills ..................................................................................................................... 25
   MoCA .................................................................................................................................... 25
   ABCD-Subtests .................................................................................................................... 26
   Retention of Skills ............................................................................................................... 26
   Limitations ............................................................................................................................. 27
   Conclusions .......................................................................................................................... 28
2.6 References ............................................................................................................................... 28

Chapter Three: External Memory Aid Preferences of Individuals with Mild Memory
Impairments ............................................................................................................................. 32
3.1 Introduction ............................................................................................................................. 32
   Research Questions .............................................................................................................. 38
3.2 Methods ................................................................................................................................... 38
   Participants ............................................................................................................................ 39
   Procedures ............................................................................................................................. 39
   Group Intervention .............................................................................................................. 39
   Calendars .............................................................................................................................. 40
   Timers .................................................................................................................................... 40
   Personal information .......................................................................................................... 40
   Preference Questionnaire .................................................................................................... 41
   Intervention Video Transcripts ........................................................................................... 41
   Data Analysis and Reliability ............................................................................................... 42
   Preference Questionnaire Analysis .................................................................................... 42
   Intervention Transcript Analysis ......................................................................................... 42
3.3 Results ..................................................................................................................................... 43
   Preferences Following Intervention ...................................................................................... 43
   Experiences During Intervention .......................................................................................... 44
   Positive Reactions to EMA Treatment ................................................................................. 44
   Negative Reactions to EMA Treatment ............................................................................... 44
   Adoption and Modification of EMA ..................................................................................... 45
   Memory Ability Awareness ................................................................................................. 45
   Attitudes About Technology ................................................................................................. 46
3.4 Discussion ............................................................................................................................... 46
   Preferences Following Intervention ...................................................................................... 47
   Individual Differences ......................................................................................................... 47
   Considering Sensory Impairments ....................................................................................... 48
   Independent Living ............................................................................................................... 48
   Experiences During Intervention .......................................................................................... 49
   Individual Differences ......................................................................................................... 49
   Considering Sensory Impairments ....................................................................................... 50
   Attitudes About Technology ................................................................................................. 50
   Group-Based Interventions ................................................................................................. 51
Chapter Four: Structured External Memory Aid Treatment .............................................. 57
4.1 Introduction .................................................................................................................... 57
Research Questions ........................................................................................................... 62
4.2 Methods ....................................................................................................................... 63
Participants ......................................................................................................................... 63
Measures and Materials .................................................................................................... 64
Screening Measures ......................................................................................................... 64
Dependent Measures ........................................................................................................ 64
Treatment Materials ....................................................................................................... 66
Design and Procedures ..................................................................................................... 66
Pre-Treatment Assessment ............................................................................................ 67
Baseline Phase ................................................................................................................ 67
Treatment Phase ............................................................................................................ 67
Maintenance Phase ........................................................................................................ 70
Post-Treatment Phase .................................................................................................... 70
Reliability .......................................................................................................................... 70
Inter-Rater Reliability ..................................................................................................... 70
Fidelity ............................................................................................................................... 70
4.3 Results ......................................................................................................................... 71
Functional Use of EMAs .................................................................................................. 71
Maintenance ...................................................................................................................... 75
Self-perceived Strategy Use ............................................................................................ 75
4.4 Discussion .................................................................................................................... 76
Functional Strategy Use .................................................................................................. 76
Maintenace of Skills ......................................................................................................... 78
Self-perceived Strategy Use ............................................................................................ 78
Limitations ........................................................................................................................ 80
Conclusions ....................................................................................................................... 80
4.5 References ................................................................................................................... 81

Chapter Five: The Development and Initial Validation of the Functional External Memory
Aid Tool ............................................................................................................................... 84
5.1 Introduction ................................................................................................................... 84
Cognitive Impairment-Based Assessments ...................................................................... 85
Cognitive Screening Tools .............................................................................................. 85
Comprehensive Dementia Assessment Batteries ............................................................... 86
Activities of Daily Living Assessments ............................................................................ 88
Informant-Based Measures ............................................................................................ 88
Performance-Based Measures .......................................................................................... 89
Compensatory Strategies ................................................................................................. 91
Self-Report Strategy Measures ......................................................................................... 92
Simulated External Memory Aid Assessment ................................................................. 93
LIST OF TABLES

Table 2.1: Participant Demographics .................................................................................................................. 10
Table 2.2: Types Of External Memory Aids ........................................................................................................... 13
Table 2.3: Study Procedures ...................................................................................................................................... 14
Table 2.4: Group 1's Role Play Activity Scores and EMA Type ............................................................................ 19
Table 2.5: Group 2's Role Play Activity Scores and EMA Type ............................................................................ 19
Table 2.6: Group 1's Total Dependent Measure Scores ......................................................................................... 20
Table 2.7: Group 2's Total Dependent Measure Scores ......................................................................................... 21
Table 4.1: Participant Demographics ..................................................................................................................... 64
Table 4.2: Treatment Schedule ............................................................................................................................. 68
Table 4.3: Fixed Effects: Average Treatment Effect Across Dyads ......................................................................... 74
Table 4.4: Random Effects (empirical Bayes): Variability of Estimated Treatment Effect Between Participants .......... 75
Table 4.5: MMQ Scores and Pre-Post Sub-Scale Comparisons ............................................................................... 76
Table 5.1: Mean Scores from Expert Reviewers, Summary Statements of Narrative Feedback, and Researcher's Response to Feedback ........................................................................................................... 98
Table 5.2: Number of Participants Recruited at Each Site Location ...................................................................... 101
Table 5.3: Confirmatory Factor Analysis Results for Goodness of Fit ...................................................................... 105
Table 5.4: Item Descriptives, Item-To-Total Correlations, Intraclass Coefficients, and Standardized Estimates (Loadings) ......................................................................................................................... 106
Table 5.5: Correlations of Education, Age, MoCA, and MMQ ................................................................................. 108
LIST OF FIGURES

Figure 4.1: The Score on the Roleplay Assessment across baseline treatment and maintenance, Sessions for each of the Three Dyads................................................................. 73

Figure 5.1: Confirmatory factor analysis model................................................................. 104

Figure 6.1: Simulated assessment tools of everyday external memory aid use.................... 127

Figure 6.2: Functional External Memory Aid Tool decision-making framework.................. 129
ABSTRACT

Individuals with mild neurocognitive disorder complete many activities of daily living independently; however, they may require the use of compensatory strategies while performing everyday tasks. Compensatory strategies, such as external memory aids, incorporate a strengths-based approach to enhance the functional needs of individuals. Although external memory aids have a strong evidence-base, limited assessment tools and interventions are available to facilitate the development of individualized treatment plans that promote sustained strategy use. To better support the everyday needs of individuals with mild neurocognitive disorder and to inform clinicians who are developing interventions, the current dissertation includes four paper that examine a functional framework for external memory aid assessment and intervention. The first paper examined a group intervention teaching three types of external memory aids on functional strategy use, perceived strategy use, and cognitive skills. The second paper identified individual preferences for experiences with external memory aids during and following intervention. The third paper examined individual changes in functional and perceived strategy use following a group-based intervention teaching external memory aids. Lastly, the fourth paper examined the content validity and internal structure of the Functional External Memory Aid Tool: a measure that explores external memory aid use with simulated everyday tasks. By understanding the weaknesses in currently used assessment and intervention practices and the unique preferences of clients, this multi-manuscript dissertation aims to enhance the immediate and long-term needs of individuals with mild neurocognitive disorder.
CHAPTER ONE: INTRODUCTION

Many individuals with mild neurocognitive disorder demonstrate a change in cognition that interferes with performing everyday tasks to the same speed and efficiency as typically aging peers (Petersen, 2004). These cognitive changes are associated with decreased memory skills that effect encoding, storing, and accessing information necessary to recall and execute complex activities of daily living (Hickey & Bourgeois, 2018). In some individuals, these cognitive impairments may progress to a formal diagnosis of dementia (Petersen, 2004). Therefore, focusing assessments and interventions at the impairment level for these individuals is not recommended (Holland, 2003). Rather, assessment and treatment plans need to identify and address strengths and weaknesses according to the functioning level, which is consistent with the World Health Organization’s (WHO) International Classification of Functioning, Disability, and Health (WHO, 2001).

According to the WHO-ICF model (2001), an individual’s functioning level (e.g., participation in everyday activities) represents the interaction among the personal, social perspective, and impairment factors. Therefore, assessments and interventions for individuals with mild neurocognitive disorder must maximize participation in daily life that is both meaningful and satisfying for the client (Hickey & Bourgeois, 2018).

Compensatory-based interventions, such as external memory aids, support an individual’s functioning level because the focus is on developing and teaching strategies that compensate for cognitive impairments (Bourgeois, 2013; Sohlberg & Mateer, 2001). External memory aids
compensate for memory impairments by taking advantage of the individual’s remaining abilities to encode and retrieve information needed to complete daily tasks. Both the American Speech-Language and Hearing Association (2005) and American Psychiatric Association (2013) have emphasized the importance of developing and using compensatory strategies to enhance independence for individual with mild neurocognitive disorder.

Unfortunately, limited guidance exists to support clinicians in focusing specifically on developing and teaching external memory aids throughout the assessment and intervention phases of care for individuals with mild memory impairments. Most assessment tools available for professionals to use are impairment-based tests and provide limited information on performance of individual strategies that might inform individualized treatment plans (Hickey & Bourgeois, 2018). In addition, external memory aids are commonly taught during intervention in combination with other cognitive strategies without consideration of the unique personal and environmental factors that may impact sustained use (Greenaway, Duncan, & Smith, 2012; Kinsella et al., 2009). Although these strategies facilitate independent performance of everyday tasks, external memory aids are rarely maintained following intervention (Scherer, 2009). Therefore, additional research is needed to address these limitations to improve the gaps between external memory aid assessment and the development of individualized interventions.

The purpose of this multi-manuscript dissertation is to examine the effects of restructuring external memory aid assessment and intervention on the performance of everyday tasks for individuals with mild neurocognitive disorder. The first paper examined a group intervention teaching three categories (i.e., calendars, timers, and personal information) of external memory aids on functional strategy use, perceived strategy use, and cognitive skills. The
second paper identified individual external memory aid preferences following intervention and treatment experiences during intervention. The third paper examined individual changes in functional and perceived strategy use following a structured intervention teaching external memory aids across four weeks. The fourth paper examined the content validity and internal structure of the Functional External Memory Aid Tool.

By restructuring current compensatory assessment and intervention practices, professionals will enhance the functional needs of individuals with mild neurocognitive disorder. Using this new approach, we can begin to develop a proactive and functional model for assessment and intervention that will possibly enhance the current skills of individuals and facilitate sustained strategy use following intervention.

References


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


CHAPTER TWO: GROUP EXTERNAL MEMORY AID TREATMENT FOR MILD COGNITIVE IMPAIRMENT

Note to Reader

Portions of this chapter have been previously published in *Aphasiology*, 2018, 33(3): 320-336, and have been reproduced with permission from Taylor & Francis Group.

Introduction

Mild Cognitive Impairment

Approximately twenty percent of older Americans are currently living with mild cognitive impairment (MCI; Roberts & Knopman, 2013). People with MCI experience changes in memory that are greater than expected due to normal aging; however, their ability to complete basic activities of daily living remains relatively intact (Petersen, 2004). MCI is now included within Neurocognitive Disorder (NCD), according to the DSM-V (American Psychiatric Association, 2013). The DSM-V distinguishes between mild and major NCD classification based on cognitive impairment and completion of activities of daily living. Although people within the mild classification often live independently, they may require compensatory strategies to maintain social relationships and complete cognitive communication tasks. Individuals with MCI primarily have impairments in short-term memory; however, communication difficulties are often observed (Constantiniduo, Wertheimer, Tsanadis, Evans, & Paul, 2012; Doty, 2007; Johnson & Lin, 2014). Limited research exists to guide clinicians working with these individuals to support cognitive communication impairments.

Cognitive interventions for individuals with memory impairments include compensatory
and restorative approaches. Most of these approaches were developed for individuals with dementia or traumatic brain injury; only recently, cognitive interventions have been adapted for individuals with MCI. Researchers have evaluated the changes in cognition, function, and quality of life following a variety of cognitive interventions for individuals with MCI. Systematic reviews (Jean, Bergeron, Thivierge, & Simard, 2010; Stott & Spector, 2011) revealed that most of the reviewed studies involved instruction for internal (e.g., mnemonics) or external (e.g., calendar) memory strategies. Several studies concluded that individuals with MCI could learn compensatory memory strategies (Troyer, Murphy, Anderson, Moscovitch, & Craik, 2008). Instruction in the use of external strategies resulted in greater improvements in functional tasks for individuals with MCI than those who received instruction in the use of internal strategies (Stott & Spector, 2011).

**External Memory Aids**

Many types of external memory aids (EMAs) exist; such as, weekly planners, written schedules, calendars, and timers to support memory, and notebooks, memory wallets, and log books to support communication impairments (Bourgeois, 2013; Garrett & Yorkston, 1997; Hersch & Treadgold, 1994; Sohlberg & Mateer, 2001). When provided with appropriate instruction, EMAs allow individuals to compensate for their cognitive communication impairments in daily activities (Sohlberg & Mateer, 2001). Early instruction in EMAs is likely beneficial for people with MCI, because their procedural memory is relatively intact enhancing the opportunity to learn a new skill (Constantinidou et al., 2012).

Successful use of EMAs requires systematic evidence-based instruction in their functional use. Existing studies have mostly investigated interventions for the use of multiple strategies instead of only instruction in the use of EMAs. Kinsella et al. (2009) examined the
effectiveness of a problem-solving approach for memory impairments delivered via group
treatment for 52 participants diagnosed with MCI. The participants learned across five sessions
about memory as a multifactorial construct, EMAs, strategies for organizational and attention
skills, as well as internal memory aids and general coping strategies. Following group treatment,
the participants increased their knowledge and use of memory strategies as indicated on the
Multifactorial Memory Questionnaire (MMQ; Troyer & Rich, 2002). The researchers measured
prospective memory using the Reminder Task and Envelope Task (Wilson et al., 2008; Huppert,
Johnson, & Nickson, 2000). Participants’ mean scores increased following treatment, with a
medium sized group effect. The researchers concluded that early intervention with this
population via group treatment could minimize everyday memory failures (Kinsella et al., 2009).

Bourgeois (2013) expanded upon Kinsella's et al. (2009) group intervention study with
activity-based training for individuals with MCI. The treatment emphasized the importance of
goal-oriented treatment targets and group training. This study examined eight participants with
MCI who completed a 10-week group treatment program for memory impairments. The
researcher taught multiple cognitive support strategies (i.e., written supports, organization,
routines, active observation, and verbal elaboration) and encouraged participants to use the
strategies that worked best for them. Bourgeois (2013) measured objective memory performance
using the Montreal Cognitive Assessment (MoCA; Nasreddine et al., 2005) pre- and post-training
and reported maintenance or decrease in scores following treatment. Strategy use, as measured
by the MMQ, increased following treatment. Participants reported using at least one strategy
(most frequently used: calendars, routines, visual cues, and written reminders), and seeing
improvement in the performance of everyday tasks that required memory skills. Long-term
maintenance of trained strategy use was not measured. It is unknown if EMA use maintained
following treatment or if maintenance would be more lasting if training focused exclusively on EMAs. Teaching only external memory aids could allow for greater repetition of concepts and more robust learning effects. In addition, group treatment could potentially be more personalized to the individual's cognitive communication needs when training only one strategy.

Sohlberg and Mateer (1989) developed a formal training program consisting of teaching EMAs in three phases (i.e., acquisition, application and adaptation) for individuals with traumatic brain injury. Research has shown that individuals with TBI experience fewer everyday memory failures when trained to use EMAs using this approach compared to supportive group treatment (Schmitter-Edgecombe, Fahy, Whelan, & Long, 1995).

Few MCI treatment studies involve instruction in EMAs using a structured approach like Sohlberg and Mateer’s three-phase training program (1989). Greenaway, Duncan, and Smith (2012) instructed people with MCI to use calendars/planners through the Memory Support System, a pocketsize calendar (two pages per day) and note taking system. The researchers trained 20 dyads (individuals with MCI and their caregiver), for twelve, one-hour sessions across six weeks, to use EMAs through the three-phase training program (Sohlberg & Mateer, 1989). The MSS included three sections: 1) appointment, 2) “to do” items, and 3) journaling. The researchers reported the trained participants significantly improved activities of daily living as measured by the memory scale of The Everyday Cognition (Farias et al., 2008) following intervention and 8-weeks later; however, these changes were not maintained at the six-month follow up. The findings of this study suggest individuals with MCI can learn to use EMAs for up to 8 weeks provided appropriate training, and the use of an explicit single strategy treatment of sufficient training duration (Stott & Spector, 2011).
To better understand how to provide the most effective instruction in compensatory memory strategies for people with MCI, researchers need to evaluate the type of training program and EMA that is most likely to produce long lasting outcomes. To date, no treatment programs for people with MCI have included Sohlberg and Mateer’s (1989) three-phase training approach using a group model. The current study evaluated an intervention program that incorporated individualized training within a group format. Specifically, the researchers evaluated the effects of a structured group treatment intervention on functional EMA use, cognitive abilities, and long-term maintenance of skills.

Research Questions

1. What is the effect of structured group treatment for individuals with probable MCI on their functional use of external memory aids to compensate for memory impairments compared to before treatment and do these changes maintain for six-weeks and 18-months following intervention?

2. What is the effect of structured group treatment for individuals with probable MCI on their cognitive skills post-treatment and do these changes maintain for six-weeks and 18-months following intervention?

Methods

Participants

Individuals in the current study’s community based sample self-reported memory impairments and completed activities of daily living independently. Seven females (ages 72 to 88 years) requested to be involved in the study and completed study consent procedures. The participants lived independently at the same senior retirement apartment complex, spoke English as their first language, and reported no prior learning or language impairments. The independent
retirement living complex is for individuals above the age of 62 who require no in-home medical or functional assistance. Participants were distinguished from individuals with major neurocognitive disorder in that according to self and staff report, they completed basic activities of daily living independently (Petersen, 2004). Exclusion criteria also included a self-reported history of psychiatric illness and a score greater than 25 on the MoCA. The researchers used the MoCA as a descriptive measure to confirm the presence of mild memory impairment representative of probable MCI. Six participants scored an overall mean of 23 (range = 21 to 25) on the MoCA (which is within the range of MCI (21 to 25)) (Nasreddine et al., 2005) (Table 2.1). Only one potential participant was excluded from the study due to her MoCA score of 26. The participants were randomly divided into two nearly equivalent groups of three people each [Group 1: MoCA M(SD) score = 23.6/30 (1.5); Group 2: 23.3/30 (2.0)]. Group 1 participants were older (M=82; SD=8.7) than Group 2 participants (M=74 years; SD=1.0).

Table 2.1. Participant Demographics.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Group</th>
<th>Age (years)</th>
<th>Years of Education</th>
<th>Vision Screening</th>
<th>Hearing Screening</th>
<th>MoCA Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>88</td>
<td>12</td>
<td>Pass</td>
<td>Pass</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>72</td>
<td>14</td>
<td>Pass</td>
<td>Pass</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>86</td>
<td>12</td>
<td>Pass</td>
<td>Pass</td>
<td>22</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>82 (8.71)</td>
<td>12.66 (1.55)</td>
<td>Pass</td>
<td>Pass</td>
<td>23.66 (1.5)</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>75</td>
<td>12</td>
<td>Pass</td>
<td>Pass</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>75</td>
<td>14</td>
<td>Pass</td>
<td>Pass</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>74</td>
<td>14</td>
<td>Pass</td>
<td>Pass</td>
<td>21</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>74 (1)</td>
<td>13.33 (1.15)</td>
<td>Pass</td>
<td>Pass</td>
<td>23.33(2.0)</td>
</tr>
</tbody>
</table>

Materials

Screening. Participants’ self-reported medical history and ability to complete activities of daily living were obtained through a structured interview of auditorily presented questions. The examiner documented information obtained from the interview on a demographic form.
Questions regarding medical history inquired about medications specific to cognitive functioning, psychiatric illness, stroke, neurological disorders, and language/learning impairments. The participants were also asked questions related to functional independence. For example, the examiner asked, “what daily activities do you need assistance with and why?” The researcher then restated the question specifically to gain information about cooking, cleaning, bathing, and dressing. In addition, the director of the senior living facility was asked the same questions regarding each participant to confirm independent completion of daily tasks.

Functional vision and hearing screenings were administered to assess impairments that may possibly impact conversation of a small group. The participants’ hearing was assessed for standard pure tone averages (i.e., 500 Hz, 1000 Hz, and 2000 Hz) at 25dB HL (within normal hearing classifications) using a portable audiometer (American National Standards Institute, 2004; Lin, Thorpe, Gordon-Salant, & Ferrucci, 2011). Five participants passed the hearing screen at 25dB HL and one participant passed at 30dB HL. This pass criterion was deemed appropriate because of the testing environment noise level and mild hearing loss classification that did not impact functional conversation (Huang & Tang, 2010). All of the participants passed the vision screen. The vision screening consisted of a visual scanning task in which the participant pointed to her name from foil names written in 18-point font on a piece of white paper (five rows of four names each).

**Dependent measures.** The participants’ functional EMA use was evaluated with a researcher-designed Role Play Activity in which a pre-recorded, 2-minute voicemail about an upcoming event (e.g., doctor appointment) was played (Appendix A includes an example transcript). To reduce practice effects, the researchers developed several voicemails following the same format. The information within the voicemails (e.g., the type of appointment) were
altered each administration. The version of the voicemail was randomly administered to each participant. The examiner told the participants they would hear a voicemail and be asked questions immediately following the recording. The examiner told the participants they could use any of the EMAs on the table (i.e., notepad, calendar or iPad) during the task. After the voicemail played, the examiner asked seven wh-questions about facts from the recording. The examiner documented live, using a scoring sheet, recall accuracy (i.e., accurate/inaccurate) and type of EMA used (i.e., none, notepad, calendar, or iPad) for each question. The answers to the wh-questions were scored as either correct (1 point) or incorrect (0 points). For example, if the participant provided the incorrect date of the appointment no points were awarded for that question. The scores ranged from 0 to 7, which was accurate responding to the seven wh-questions. A second rater scored the video recordings of the assessment sessions using the scoring sheet.

Participants’ perceived functional use of a variety of EMAs was measured with the MMQ-Strategy subtest. Participants rated their use of 19 strategies as either all the time (4), often (3), sometimes (2), rarely (1) or never (0). Higher scores represent greater frequency of strategy use (maximum score = 76). The researchers used the Immediate-Recall and Delayed-Recall subtests of the Arizona Battery for Communication Disorders of Dementia (ABCD; Bayles & Tomoeda, 1993) as an additional measure of cognitive ability.

Treatment materials. The researchers trained three categories (i.e., calendar, timer, and personal information) of EMAs. Within each category, the participants used three types of aids; including a range of no-tech to high-tech aids (refer to Table 2.2). The researchers provided the types of aids within each EMA category for participants to use and keep during treatment and
home practice; however, the iPad versions of the EMAs were only used during assessment and treatment sessions.

Table 2.2. Types of External Memory Aids.

<table>
<thead>
<tr>
<th>Calendars (Weeks 1 and 4)</th>
<th>Timers (Weeks 2 and 5)</th>
<th>Personal Information (Weeks 3 and 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>iPad Calendar</td>
<td>iPad Alarm and Stopwatch</td>
<td>iPad Notes application</td>
</tr>
<tr>
<td>Paper Monthly</td>
<td>Stopwatch</td>
<td>Memory Wallet</td>
</tr>
<tr>
<td>Planner (weekly and monthly)</td>
<td>Hand Held: manual and electronic clip-on</td>
<td>Planner (contacts, passwords, and notes) pages</td>
</tr>
</tbody>
</table>

**Design**

The Duquesne University Institutional Review Board approved this study. The study implemented an experimental pre/post group treatment design to evaluate the effects of training EMAs during treatment group (Group 1) on participants’ functional EMA use and cognitive skills in comparison to the delayed treatment group (Group 2). Group 1 and 2’s participants completed individual pre-treatment assessments at the same time period to examine equivalence of groups prior to intervention. Following the pre-treatment assessment sessions, participants in Group 1 completed six weekly group treatment sessions and a single post-treatment assessment session immediately following treatment. Participants in Group 2 did not receive treatment immediately to serve as a control to compare individuals who did receive intervention (Group 1) to individuals who did not (Group 2). Therefore, participants in Group 2 completed an additional assessment (second pre-treatment session) during the same time period as Group 1 participant’s post-treatment assessment sessions. Following the second pre-treatment session, participants in Group 2 completed six weekly group treatment sessions, and a single post-treatment assessment
session immediately following treatment. Participants in Group 1, during the same time period as Group 2 participant’s post-treatment assessment sessions, completed a six-week follow up assessment session, to examine retention of intervention skills. All participants completed an 18-month follow-up assessment session after treatment concluded to examine long-term changes (Table 2.3 shows the study schedule). Participants completed the sessions in a quiet room at the senior retirement apartment complex. The sessions lasted approximately 90-minutes and were video-recoded. In addition, half of the treatment sessions were transcribed for treatment fidelity and scoring reliability purposes.

Table 2.3. Study Procedures.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Week 1</th>
<th>Weeks 2-7</th>
<th>Week 8</th>
<th>Weeks 9-15</th>
<th>Week 16</th>
<th>1.5 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group One</td>
<td>Pre-treatment Assessment</td>
<td>Group Treatment</td>
<td>Post-treatment Assessment</td>
<td>No Treatment</td>
<td>Six-week Follow-up Assessment</td>
<td>18-month Follow-up Assessment</td>
</tr>
<tr>
<td>Group Two</td>
<td>Pre-treatment Assessment</td>
<td>No Treatment</td>
<td>Second Pre-treatment Assessment</td>
<td>Group Treatment</td>
<td>Post-treatment Assessment</td>
<td>18-month Follow-up Assessment</td>
</tr>
</tbody>
</table>

Procedures

Pre-Treatment. During the individual pre-treatment assessment session, all participants completed the screening measures (i.e., vision and hearing screenings, a medical history and functional status interview guided by the demographic form, and the MoCA). If the participant met the study criteria, the examiner administered the remaining assessment measures (i.e., ABCD Immediate –Recall, Role Play Activity, MMQ-Strategy, and ABCD-Delayed-Recall).

Treatment. Each participant completed six weekly group treatment sessions, during which the examiner trained three categories of EMAs following a detailed training manual. As shown in Table 2.2, two non-concurrent sessions were dedicated to each category of EMAs.
Within each category, three EMA types (ranging from high-tech to low-tech) were taught to the participants. During each treatment session, the examiner trained the EMAs in three-phases, acquisition, application, and adaptation (Sohlberg & Mateer, 1989). The integration of the three-phase training approach within the current group treatment is described below.

**Introduction of the treatment approach.** During the first session, the examiner provided the participants with a schedule of the six-week treatment program. Next, the examiner described the EMAs categories and types included in treatment.

**Introduction of a new category of external aids.** The introduction of a new category of EMAs was the acquisition phase. The first category of EMAs was explained to the participants using a handout (see Appendix B). The examiner discussed how to use each aid and appropriate situations for using the aid. The participants also shared how they currently used any of the EMA types and contributed ideas for situations that might benefit from the use of EMAs.

**Functional practice.** The next phase was the application phase, which involved various role-play scenarios using the EMAs to promote functional use. For example, the examiner said, “If your friend is having a surprise birthday party, how could you use this aid to remember the date, time and type of party. Show me…”. Group members were instructed to provide each other feedback and brainstorm alternative approaches. During this phase for sessions 1 through 3, participants used each type of EMA to complete the role-play scenarios. This provided participants with exposure to all EMA types and multiple opportunities to practice within an EMA category. During sessions 4 through 6, participants chose which type/types of EMAs they wanted to use within the category to complete the role-play scenarios. Approximately five role-play scenarios were completed during this phase of treatment resulting in repetitive practice. Examples of calendar role play activities included scheduling appointments, planning dinners,
and organizing rides for grandchildren. Timer role play activities involved timing items in an oven, a workout routine, and remembering to get laundry. Finally, personal information examples included emergency contact information, doctors’ names, and 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. At the end of each session, the researchers provided a home practice handout. The handout provided questions for participants to reflect upon their experiences using the aid throughout the week. The homework promoted generalization and worked toward establishing routine use of the EMA. All six participants completed homework and shared examples of positive and negative functional EMA use.

**Review of home practice activity.** Following home practice, the participants started the next session with group discussion. Guided by their home practice handout, the participants described use of the EMA during the home practice activity and provided each other with suggestions. The participants provided feedback to each other and indicated similarities and differences in their experiences. The participants often used other participants’ ideas and altered their EMA use based on the home practice discussion.

**Post-Treatment.** Both groups completed individual post-treatment assessments immediately following treatment. During assessments the researchers administered the dependent measures (i.e., Role Play Activity, MMQ-Strategy, MoCA, and ABCD-subtests).

**Follow-Up.** Participants in Group 1 completed an individual six-week follow-up session. Participants in both groups completed an individual 18-month follow-up session. During both follow-up assessment sessions, the researchers administered the dependent measures.
**Data Analysis and Reliability**

The researchers compared between groups and within participant’s pre/post dependent measure scores to examine the effect of treatment on participants’ functional EMA use and cognitive skills. The data were analyzed using descriptive statistics and non-parametric statistics to examine the effect of treatment on participant maintenance of functional EMA use and cognitive skills. Due to the small sample size and unequal scores across groups, the researchers conducted the Wilcoxon Signed-Rank Test and the Wilcoxon Rank-Sum Test. Participants’ pre-treatment to post-treatment assessment scores and post-treatment to 18-month follow-up assessment scores were compared to examine changes within participants over time using the Wilcoxon signed-rank test. The researchers also compared post-treatment assessment scores of Group 1 to pre-treatment assessment scores of Group 2 to examine treatment differences across groups using the Wilcoxon rank-sum test. The first and second pre-treatment scores of participants in Group 2 were averaged together to reduce testing error.

To examine treatment fidelity, two raters scored 20% of the treatment sessions. The raters used a checklist (from the treatment procedure manual) to compare their scores with the examiner’s scores of the treatment videos and transcriptions. Overall percent agreement was calculated to be 87% (85 to 90%) documenting excellent inter-rater reliability.

To examine inter-rater reliability of the Role Play Activity, a second rater watched the assessment sessions. The rater used the Role Play Activity scoring sheet to score the participant’s recall accuracy and EMA use. After independent scoring, the rater and examiner compared scoring sheets; 100% point-to-point agreement was obtained.
Results

Functional External Memory Aid Use

Role play activity. As shown in Tables 2.4 and 2.5, the recall accuracy mean score during pre-treatment for Group 1 was 3.33(SD=2.88) and Group 2 was 5.66(SD=1.52) (maximum score=7.00). Following treatment, Group 1 increased their mean recall accuracy score to 6.00(SD=0) and Group 2’s second pre-treatment mean maintained at 5.66(SD=1.25)). Following treatment, Group 2’s mean score was 6.00(SD=1.73). Only Group 1 was assessed at the six-week post-treatment. As shown in Table 2.4, Participant 1 and 2 increased their post-treatment Role Play Activity score of 6.00 to 7.00 and Participant 3 post-treatment score of 6.00 decreased to 3.50 during six-week follow-up assessment. During 18-month follow-up assessment, Group 1’s mean score decreased from 5.83(SD=2.02) to 5.16 (SD=2.36) and Group 2’s mean score also decreased from 6.00(SD=1.73) to 4.83(SD=2.02). A Wilcoxon Signed-Ranks Test indicated that the post-test ranks were not statistically significantly higher than the pre-test ranks N=5, T=2; p>0.05. A Wilcoxon Rank Sum Test indicated that the difference between Group 1’s and Group 2’s summed ranks immediately following treatment of Group 1 was not statistically significant T=9, p>0.05.

In addition to recall accuracy, the Role Play Activity provided information about the types of EMAs participants used. Only Participants 2, 5, and 6 used a notepad during the pre-treatment assessment. During Group 2’s second pre-treatment Participant 6 maintained EMA use and no other participants used an EMA. Following treatment, all participants used an EMA (five participants used a notepad). Participant 4 began the assessment using the iPad and switched to the notepad half way through the assessment.
During six-week follow-up, Participants 1 and 2 continued to use the notepad. Participant 3 used the notepad halfway through the six-week follow-up task; the questions she answered correctly were when the notepad was used. During 18-month follow-up assessment, 5 of the participants used a notepad during the Role Play Activity (Participant 4 did not use an EMA). A Wilcoxon Signed-Ranks Test revealed no statistically significantly difference between post-test and follow-up ranks, N=4, p>0.05.

**Table 2.4.** Group 1's Role Play Activity Scores and EMA Type.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Treatment</th>
<th>Post-Treatment</th>
<th>Immediate Follow-Up</th>
<th>Long-Term Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recall (7)</td>
<td>EMA Use</td>
<td>Recall (7)</td>
<td>EMA Use</td>
</tr>
<tr>
<td>P1</td>
<td>5</td>
<td>0</td>
<td>6</td>
<td>1:Notepad</td>
</tr>
<tr>
<td>P2</td>
<td>5</td>
<td>1:Notepad</td>
<td>6</td>
<td>1:Notepad</td>
</tr>
<tr>
<td>P3</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1:Notepad</td>
</tr>
<tr>
<td>Mean</td>
<td>3.33</td>
<td>.33</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 2.5.** Group 2's Role Play Activity Scores and EMA Type.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Treatment</th>
<th>2nd Pre-Treatment</th>
<th>Post-Treatment</th>
<th>Long-Term Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recall (7)</td>
<td>EMA Use</td>
<td>Recall (7)</td>
<td>EMA Use</td>
</tr>
<tr>
<td>P4</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>P5</td>
<td>6</td>
<td>1:Notepad</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>P6</td>
<td>7</td>
<td>1:Notepad</td>
<td>7</td>
<td>1:Notepad</td>
</tr>
<tr>
<td>Mean</td>
<td>5.66</td>
<td>.66</td>
<td>5.66</td>
<td>.33</td>
</tr>
</tbody>
</table>

**MMQ-Strategy.** Higher scores on the MMQ-Strategy subtest indicated greater frequency of daily strategy use to compensate for memory impairments (maximum score=76).
As shown in Tables 2.6 and 2.7, Group 1’s MMQ-Strategy pre-treatment mean score was 35.66 (SD = 7.76) and Group 2’s mean score was a 38.00 (SD = 6.92). Following treatment, Group 1 increased their mean score to 39.66 (SD = 4.04) and Group 2’s second pre-treatment mean score was 39.00 (SD = 5.19). Following treatment, Group 2 increased their mean score to 42.33 (SD = 6.65). A Wilcoxon Signed-Ranks Test indicated that the post-test ranks were statistically significantly different than the pre-test ranks N=6, T=1.5, p=0.03, α=0.025. A Wilcoxon Rank Sum Test indicated no statistically significant difference between Group 1’s and Group 2’s summed ranks immediately following treatment of Group 1 N=6, T=12, p>0.05.

During six-week follow-up assessment, Participants 1 and 2 decreased their MMQ-Strategy score and Participant 2 increased her score. Group 1’s six-week follow-up mean score decreased from 40.66 (SD=8.14) to 33.66 (SD=7.63) during 18-month follow-up assessment. Group 2’s post-treatment mean score slightly increased from 42.33 (SD=6.65) to 43.00 (SD=6.08) during 18-month follow-up assessment. A Wilcoxon Signed-Ranks Test indicated that the 18-month follow-up ranks were not statistically significantly different than the post-treatment ranks N=6, T=9, p>0.05.

Table 2.6. Group 1's Total Dependent Measure Scores.

<table>
<thead>
<tr>
<th></th>
<th>MMQ-Strategy</th>
<th>MoCA</th>
<th>ABCD-Immediate</th>
<th>ABCD-Delayed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Post Im.F Lt.F</td>
<td>Pre Post Im.F Lt.F</td>
<td>Pre Post Im.F Lt.F</td>
<td>Pre Post Im.F Lt.F</td>
</tr>
<tr>
<td>P1</td>
<td>42 39 37 42</td>
<td>24 28 29 29</td>
<td>17 17 17 17</td>
<td>17 17 17 17</td>
</tr>
<tr>
<td>P2</td>
<td>27 36 35 27</td>
<td>25 28 28 25</td>
<td>14 16 17 15</td>
<td>15 14 15 15</td>
</tr>
<tr>
<td>P3</td>
<td>38 44 50 32</td>
<td>22 26 27 25</td>
<td>10 13 16 16</td>
<td>11 11 16 15</td>
</tr>
<tr>
<td>Mean</td>
<td>35.6 39.6 40.6 33.6</td>
<td>23.6 27.3 28.0 26.3</td>
<td>13.6 15.3 16.6 16.0</td>
<td>14.3 14.0 16.0 15.6</td>
</tr>
</tbody>
</table>
Cognitive Skills

Montreal Cognitive Assessment. As shown in Tables 2.6 and 2.7, Group 1’s pre-treatment mean score was 23.66 (SD = 1.52) and Group 2’s mean score was 23.33 (SD = 2.08) (maximum score=30). Following treatment, Group 1 increased their mean score from 23.66 to 27.33 (SD = 1.15). Group 2’s second pre-treatment mean score was 24.33 (SD = 0.57). Following treatment, Group 2 increased their mean score to 25.33 (SD = 1.52). A Wilcoxon Signed-Ranks Test indicated that the post-test ranks were statistically significantly different than the pre-test ranks N=6, T=0, p=0.01, α=0.025. A Wilcoxon Rank Sum Test indicated that the difference between Group 1’s and Group 2’s summed ranks immediately following treatment of Group 1 was not statistically significant N=6,T=6, p=0.05.

During six-week follow-up assessment, Participants 1 and 3 increased their MoCA score by a point and Participant 2 maintained her score. During 18-month follow up assessment, Group 1’s mean MoCA score decreased from 28.00 (SD=1.00) to 26.33 (SD=2.30). Group 2’s mean MoCA score decreased from 25.33 (SD=1.52) to 23.66 (SD=1.15). A Wilcoxon Signed-Ranks Test indicated that the 18-month follow-up ranks were not statistically significantly different than the post-treatment ranks N=6, T=13, p>0.05.

Table 2.7. Group 2's Total Dependent Measure Scores.

<table>
<thead>
<tr>
<th>MMQ-Strategy</th>
<th>MoCA</th>
<th>ABCD-Immediate</th>
<th>ABCD-Delayed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Pre2</td>
<td>Post</td>
</tr>
<tr>
<td>P4</td>
<td>34</td>
<td>36</td>
<td>39</td>
</tr>
<tr>
<td>P5</td>
<td>46</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>P6</td>
<td>34</td>
<td>36</td>
<td>38</td>
</tr>
<tr>
<td>Mean</td>
<td>38.0</td>
<td>39.0</td>
<td>42.3</td>
</tr>
</tbody>
</table>
**ABCD-Subtests.** As shown in Tables 2.6 and 2.7, Group 1’s mean score on the ABCD-
*Immediate Recall* subtest (maximum score= 17) at pre-treatment was 13.66(SD = 3.51) and
Group 2’s mean score was 11.66(SD =0.57). Following treatment Group 1’s mean score
increased to 15.33(SD = 2.08) and Group 2’s second pre-treatment score was 12.33(SD = 2.30).
Following treatment, Group 2’s mean increased to 13.00(SD = 3.46). During six-week follow-up
assessment, Participant 1 maintained the maximum score and Participants 2 and 3 increased their
scores. During 18-month follow-up assessment, Group 1’s mean score slightly decreased from
16.6(SD=.57) to 16(SD=1) and Group 2’s mean score decreased from 13(SD=3.46) to
12(SD=2.6). A Wilcoxon Signed-Ranks Test indicated that the post-test ranks were not
statistically significantly different than the pre-test ranks N=5, T=3, p>0.05. A Wilcoxon Rank
Sum Test indicated that the difference between Group 1’s and Group 2’s summed ranks
immediately following treatment of Group 1 was not statistically significant N=6, T=7, p>0.05.
A Wilcoxon Signed-Ranks Test revealed no statistically significant difference between the post-
test and follow-up ranks N=4, p>0.05.

As shown in Tables 2.6 and 2.7, Group 1’s mean ABCD-*Delayed Recall* (maximum
score = 17) pre-treatment assessment score was 14.33(SD = 3.05) and Group 2’s mean score
was 11.66(0.57). Following treatment, Group 1 maintained their pre-treatment mean score of
14.00(SD = 3.00). Group 2’s second mean pre-treatment scores decreased from 11.66(SD
=0.57) to 10.33(SD = 2.30). Following treatment, Group 2’s mean score was a 12.33(SD =
1.15). During six-week follow-up assessment, Participant 1 maintained the maximum score
and participants 2 and 3 increased their ABCD-*Delayed Recall* assessment scores. During 18-
month follow-up assessment, Group 1’s mean score slightly decreased from 16(SD=1) to
15.6(SD=1.1) and Group 2’s mean also decreased from 12.33(SD=1.15) to 11.66(SD=1.15)
on the ABCD-Delayed Recall subtest. A Wilcoxon Signed-Ranks Test revealed no statistically significantly difference between pre-test to post-test ranks and post-test to follow-up ranks N=4, p>0.05. A Wilcoxon Rank Sum Test indicated that the difference between Group 1’s and Group 2’s summed ranks immediately following treatment of Group 1 was statistically significant N=6, T=6, p=0.05.

**Discussion**

The current study examined the effects of group treatment on enhancing EMA use and cognitive abilities of individuals within the community with probable MCI.

**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 Role Play Activity depicts a common cognitive communication 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). Although the Wilcoxon tests revealed non-significant effects, N=5, T=2; p>0.05, an overall 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 affected by their cognitive communication impairments. A significant effect was not revealed on the Wilcoxon Signed-Ranks Test because the test could not be completed at the .05 alpha level, due to the participant’s maintained strategy use performance on the Role Play Activity. Although all participants did not increase performance, maintenance of skills is important because of the possible progressive nature of the impairments.

Most participants used the notepad for the Role Play Activity during the post-treatment assessment. The participants may have 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 selecting specific EMAs to help determine which EMAs clinicians might recommend during treatment.

Only one participant attempted to use the notes feature on the iPad following treatment. However, she was unable to use the iPad with the efficiency required to successfully complete the Role Play Activity and therefore received a lower score. Importantly, the participant realized she was not collecting the information appropriately and switched to using a notepad. This example suggests that failures during home practice and 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. Researchers have found that individuals are most likely to use an EMA outside of treatment if they have encountered periods of failed strategy use during intervention (Sohlberg & Mateer, 2001). Therefore, 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, researchers examined participants’ perceptions of functional EMA use through the MMQ-Strategy subtest. The statistically significant difference of post-treatment to pre-treatment MMQ-Strategy ranks (N=6, T=1.5, p=0.03, α=0.025), as indicated by the Wilcoxon Signed-Ranks Test, support the positive impact of treatment on participants’ understanding and reported daily EMA use. Previous MCI strategy treatments also found positive changes in the participants' MMQ-Strategy subtest scores (Bourgeois, 2013; Kinsella et al., 2009). Although the current study's treatment only focused on one memory strategy (EMAs) and had a smaller number of participants compared to the other studies, the participants still increased their self-reported use of strategies post intervention. Prior
to intervention, the pre-treatments group means were not equal and had relatively large standard deviations [Group 1: MMQ-Strategy M(SD) score = 35.66 (7.8); Group 2: 39.66 (4.0)]. These differences could possibly be the rationale for the non-statistically significant differences indicated by the Wilcoxon Rank Sum Test. Future research should include multiple measures to examine pre-treatment strategy knowledge and possibly better understand differences across participants.

While the gains within the current study were minimal, given the progressive nature of the participants’ diagnoses and the similar findings from previous studies, the improvements in EMA use during a structured activity (i.e., Role Play Activity) and reported EMA use (i.e., MMQ-Strategy) during functional activities highlight the potential benefits of group EMA intervention for individuals with probable MCI.

**Cognitive Skills**

**MoCA.** Although the primary aim of the intervention was to provide instruction in the use of compensatory strategies, statistically significant rank differences between post-treatment and pre-treatment on the MoCA suggests participants’ cognitive skills were indirectly affected. That is, participants demonstrated a slight increase in or maintenance of cognitive abilities during post-treatment assessments. These data should be interpreted with caution, however, because of the small sample size, relatively small change demonstrated, and non-significant differences between Group 1 and Group 2’s summed ranks immediately following treatment of Group 1.

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 preliminary results 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.

**ABCD-Subtest.** The statistically significant difference between Group 1’s and 2’s summed ranks immediately following treatment of Group 1 for the ABCD-Delayed Recall subtest, as indicated by the Wilcoxon Rank Sum Test, further supports the indirect relationship between EMA treatment and change in delayed recall skills. Improved scores on both the MoCA and ABCD assessments of delayed recall provide support for a possible 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 probable MCI.

Although MCI can be a progressive condition, other studies that have examined cognitive interventions have identified improvements in cognitive abilities (e.g., Li et al., 2011). The intensity and repetition throughout the current study's single-strategy, EMA, treatment approach could have had an effect on the participants’ cognitive skills, compared to studies of multiple strategy approaches.

**Retention of Skills**

Participants in Group 1 were assessed six-weeks post-intervention and all participants were assessed approximately 18 months later to analyze retention of skills after a period without treatment. The differences between post-treatment and follow-up assessment scores were inconsistent and not statistically significant across all dependent measures. These data of retention of functional EMA use are similar to the results found by Kinsella et al. (2009). Both the current study and the Kinsella et al. (2009) study found inconsistent participant scores;
however a majority of participants reported decreased strategy use during follow-up assessments. Therefore, when some participants are not receiving treatment they perceive a decrease in daily strategy use. Individuals would probably benefit from on-going treatment or continued booster sessions once intervention is complete. The current study was the first to examine long-term (greater than one year) EMA use following intervention. Willis et al. (2006) examined long-term effects five-years following cognitive training; however, the researchers provided booster training. The researchers found an increase in participants’ reasoning and speed of processing when provided booster training (Willis et al., 2006).

Limitations

Although the current study findings provided support for group EMA treatment for a sample of individuals with probable MCI, the study included several limitations. The study sample size was small, although appropriate for an exploratory study, and limits the conclusions that can be drawn. Additionally, all the participants were women and lived in the same apartment complex. Gender and the group size may affect the dynamics and interactions within groups and should be investigated in future studies with familiar and unfamiliar group members.

Some of the findings relate to participants’ self-perception of memory impairments and EMA use. Although the MMQ is a validated assessment tool, the limitations of self-reported data are still present. In the future, informants who live with the participant could also rate participants’ use of EMAs to provide another measure for comparison.

Due to the exploratory community based nature of this study, the researchers conducted limited cognitive testing without alternative forms (MoCA, ABCD-subtests) and did not seek a physician’s diagnosis to include participants. Data on the rate of progression will allow researchers to best measure the relationship between the treatment and participants’ cognitive
skills. Overall the current knowledge on MCI progression is inconclusive (Petersen et al., 2014). If more information was known on the rate of progression, researchers could more appropriately examine the importance of maintenance of skills. The current study’s data analysis deleted cases that the participants maintained performance, resulting in a minimum p-value of .0625. Future research should consider incorporating a single-participant study design. Due to the unknown rate of progression and inconsistent participant performance, a single-participant design may better account for individual differences and maintenance of skills. In addition, future research needs to continue to assess participants for longer follow-up periods and define more appropriately the exclusion criteria to reduce variability and better identify progression (Petersen et al., 2014).

**Conclusions**

This preliminary study employed a small community sample to describe effects of an innovative evidence-based, group treatment for EMA use in people with probable MCI. Positive findings suggest that individuals with probable MCI can learn to use EMAs and they report that EMAs positively affect their daily life by improving cognitive communication skills. Additionally, group EMA treatment resulted in small gains in objective cognitive skills for some participants. Future research should investigate the effect of various types of EMA treatments on use of aids in daily life and possible changes in cognitive skills.

**References**


Huang, Q., & Tang, J. (2010). Age-related hearing loss or presbycusis. *European Archives of*
Oto-Rhino-Laryngology, 267, 1179–1191.


CHAPTER THREE: EXTERNAL MEMORY AID PREFERENCES OF INDIVIDUALS WITH MILD MEMORY IMPAIRMENTS

Note to Reader

Portions of this chapter have been previously published in *Seminars in Speech and Language*, 2018, 39(3): 211-222, and have been reproduced with permission from Thieme Medical Publishers.

Introduction

As individuals age, cognitive changes become more common and may interfere with everyday activities. Older adults frequently notice changes in their memory, especially short-term impairments (e.g., walking into the bedroom and forgetting why they went in the bedroom) and delayed-intention impairments (e.g., planning on going to a specific store and then forgetting to do so when they are out) (Cohen-Mansfield et al., 2005). These impairments may be related to age associated cognitive changes; however, another potential etiology of these impairments may arise from a progressive neurodegenerative pathology.

The *Diagnostic and Statistical Manual of Mental Disorders, 5th edition* (DSM-V; American Psychiatric Association, 2013), classifies neurocognitive disorder across a continuum from mild to major impairments and uses etiologies to determine subtypes (e.g., neurocognitive disorder due to Alzheimer’s disease). To distinguish between mild and major severities, the cognitive and functional skills of an individual are described. Individuals with mild neurocognitive disorder have impairments in one or more cognitive domains and complete
activities of daily living independently; however, they often require the use of compensatory strategies to complete tasks successfully (American Psychiatric Association, 2013).

Compensatory strategies are beneficial for individuals with cognitive impairments because, either, the demands placed on one’s impaired abilities are limited, or the preserved abilities of an individual are reinforced through appropriate task modification (Sohlberg & Turkstra, 2011). Compensatory strategies for memory can be divided into two major categories: internal and external aids. Internal memory aids, such as mental rehearsing and mnemonics, rely on one’s memory ability and help reorganize the way one stores and retrieves information. Internal memory aids are often difficult for individuals with progressive impairments because of the reliance on memory skills and increased demands on cognitive processing (Stott & Spector, 2011). External memory aids (EMAs), however, reduce cognitive demands by capitalizing on one’s remaining strengths and incorporating environmental cues (Lanzi, Burshnic, & Bourgeois, 2017). For example, if a person is consistently misplacing their hearing aids, a container can be placed on a nightstand with a note stating, “I put my hearing aids here before bed.” The written note capitalizes on preserved reading abilities and the location of the container is an environmental cue. EMAs, such as written notes, are evidence-based approaches that promote functional activities in naturalistic settings for individuals with mild neurocognitive disorder (Sohlberg & Turkstra, 2011).

Researchers suggest that individuals with mild memory impairments can learn how to use EMAs when they are provided appropriate training (Bourgeois, 1993). Using such EMA strategies in everyday situations often improves topic maintenance in conversation, increases independent completion of activities, and decreases problematic behaviors (Bourgeois, Burgio, Schulz, Beach, & Palmer, 1997; Hoerster L, Hickey, & Bourgeois, 2001; Kinsella et al., 2009).
Additionally, maintaining independence has been associated with improved overall quality of life (Hopper et al., 2013). Although EMAs are well researched and generate positive treatment effects, a considerable proportion of individuals provided with supports never use them following intervention (Cohen-Mansfield et al., 2005; Gitlin, Schemm, Landsberg, & Burgh, 1996; Scherer, 2005). The adoption and continued use of an EMA strategy may depend on how the strategy is developed and trained. An individual’s needs, daily life, and environment should be considered in both the design and training phase of a strategy to promote long-term EMA maintenance. Integrating a person-centered approach will best support clinicians in evaluating the whole person and environment (Lanzi et al., 2017; Scherer, 2005). In using a person-centered approach, the focus of care shifts from the individual’s impairment to his or her remaining strengths. Examining an individual’s strengths includes not only cognition, but also emotional and psychosocial abilities (Epp, 2003). When designing a compensatory strategy, the primary goal is for the individual to integrate the approach into daily life and for the approach to meet the person’s individual needs. Therefore, psychosocial factors, such as family, culture, and gender, will affect the structure of the strategy. For example, if a female is the family cook she may benefit from a cookbook adapted for memory and executive functioning needs to support successful completion of a favorite recipe. Each individual has unique needs, abilities, expectations, and past experiences that may affect the design and eventual reaction to compensatory strategies. Therefore, it is the responsibility of the skilled professional to analyze and provide multiple feature choices of the EMAs during the strategy development phase for individuals with neurocognitive disorders.

Including skilled professionals throughout the continuum of compensatory strategy services is not a novel concept. The International Classification of Functioning, Disability, and
Health (ICF), developed by the World Health Organization considers external strategies to be environmental factors (World Health Organization, 2001). Examining EMAs within the ICF framework is critical because environmental factors can directly affect body functions, activities, and participation (Scherer, Hart, Kirsch, & Schulthesis, 2005). An individual’s participation in everyday environments, such as public areas and work sites, depends on accommodations, assistance, and accessible forms of information. Without these resources, an individual with disabilities lose self-identified meaning in societal or desired social roles. Additionally, most everyday environments include barriers for individuals with cognitive disabilities (e.g., insufficient maps available at a shopping mall and inconsistent aisle layouts at grocery stores). Therefore, professionals need to carefully consider one's everyday environment to ensure the EMA will be used within the community setting. Incorporating a person-centered approach into the development phase of strategies will best assist professionals in supporting the individual with a disability. One method of implementing a person-centered approach in the strategy development phase is by examining individual preferences and attitudes toward EMAs (Brown, Hux, Hey, & Murphy, 2017). Although there is a critical need to examine individual preferences, limited research exists to guide professionals.

Researchers have attempted to investigate potential factors that influence EMA use and provide information regarding commonly used strategies. For example, Wilson (1991) gathered information from 43 individuals who had experienced a severe head injury resulting in severe memory-impairments following rehabilitation. The researcher reported that the number of strategies used by an individual related to the level of independence he or she reported. In addition, the most commonly used strategies included notebooks, calendars, lists, and mental retracing of events. Wilson and Watson (1996) expanded upon these data to identify specific
personal factors related to positive and negative strategies used by individuals seven years post brain injury. The following factors were found to predict use of six or more memory aids: age, severity of memory impairment, absence of additional cognitive deficits, and premorbid memory strategy use. To better define the predictive factors and examine commonly used supports, Evans and colleagues (2003) surveyed 94 individuals with memory-impairments post brain-injury. The researchers reported 79.5% of the most commonly used aids to support memory-impairments were non-electronic. Of the 44 different aids reported to be used by participants, the top four included: a wall calendar (n=68), a notebook (n=60), a list (n=59), and an appointment diary (n=51). The most commonly used electronic EMAs included an alarm clock (n=38) and watch with date or timer (n=17). The researchers also reported additional personal predictive factors and analyzed the direct relationship between the number of strategies used and level of independence. The results of the reviewed studies highlight the importance of examining personal factors and individual differences that impact strategy use.

Although the results from the previously discussed studies indicate that non-electronic EMAs are used most often, researchers continue to investigate individual preferences across the range of technology-based EMAs. For example, Brown and colleagues (2017) employed a mixed-methods design to evaluate the cognitive support preferences of eight participants with acquired brain injuries. The researchers reported inconsistent strategy use by participants: three participants used low-tech supports and four participants used high-tech supports. Qualitative analysis of transcripts revealed four subthemes regarding desirable external cognitive strategies: 1) having access to pop-up reminders; 2) system portability, convenience, and access; 3) task prioritization features; and 4) having adequate space for note recording. When presented with a variety of strategies, five of eight participants chose high-technology strategies as their most
preferred type. This is especially important, because technology use has likely evolved throughout the years between the reviewed publications. These findings provide important insights when developing strategies for individuals while incorporating a person-centered approach.

Similarly, Cohen and colleagues (2005) administered a questionnaire to 100 community-dwelling seniors to examine user characteristics, user requirements, and operational requirements regarding electronic EMAs. The researchers reported 58% of participants answered “yes” they would use an electronic device. The best predictors of participants’ willingness to learn how to use an electronic EMA were familiarity with machines and statements about the importance of different features of the electronic EMAs. Participants’ most reported everyday memory impairments were forgetting birthdays and missing medications. The majority of participants (92%) used a calendar and phone book frequently and 73% of participants preferred the aid to be small, or hand held. In addition, participants reported previous physical problems associated with electronic EMAs (e.g., hard to operate due to the size of the buttons). The authors suggested that more than one method should be offered to individuals and limitations of the aid for each individual need to be considered during the strategy development phase. In addition, this study provided initial evidence of the electronic EMA preferences of older adults. However, more research is needed to investigate individual preferences for older adults across all types of EMAs.

In summary, the reviewed studies highlight the importance of using a holistic, person-centered approach when developing compensatory memory strategies for people with neurocognitive disorders. Due to the limited frequency of strategy maintenance following intervention, researchers must continue to explore individual preferences to enhance strategy use
(Scherer et al., 2005). The majority of participants in the previous research studies had neurocognitive disorders from acquired brain injury and involved a focus on electronic EMAs. The aims of the current study were to explore EMA strategy preferences of older adults with mild memory impairments/possible mild neurocognitive disorder from a degenerative neurological disease who received intervention exploring multiple types of EMAs (ranging from no-tech to high-tech). Unlike the previous studies that involved data collection prior to intervention, in the current study individual preferences were evaluated during and following intervention employing a mixed-methods design.

Research Questions

1. Which types of EMAs do older adults with mild memory impairments prefer following a group-based intervention?
2. How do older adults with mild memory impairments describe their experiences exploring, selecting, and implementing EMAs for completion of functional activities during a group-based intervention?

Methods

The researchers obtained qualitative data from a group treatment study for individuals with mild memory impairments/possible mild neurocognitive disorder; the quantitative data is presented in an associated paper (Lanzi, 2016). The group treatment study included a total of six participants (three participants in both Treatment Group 1 and Treatment Group 2 [Delayed Treatment Group]). To examine the preferences of individuals following treatment, the researchers qualitatively explored the data from a post-treatment preference questionnaire administered individually to each of the six participants. Additionally, to examine participant experiences during intervention, the researchers conducted a thematic analysis of the transcripts
of Treatment Group 1’s intervention sessions following conclusion of the study. A transcendental phenomenological approach (Moustakas, 1994) was used to qualitatively evaluate the transcripts. This approach allowed the researchers to explore meanings and perceptions of individuals regarding a specific situation (Brown et al., 2017). In addition, this approach was selected due to the importance of understanding the shared experiences of group members during an intervention training several EMAs and the approach was used in similar research with individuals with acquired brain injuries (Brown et al., 2017).

**Participants**

As described in the associated research (Lanzi, 2016), six female participants completed the group EMA intervention after consenting to participate using Duquesne University Institutional Review Board's approved forms. All participants passed the functional vision and hearing screenings and lived by themselves in a senior retirement apartment complex. Participants completed activities of daily living independently, however, they all reported changes in cognition (specifically, memory). In addition, all participants scored between 21 and 25 on the Montreal Cognitive Assessment (Nasreddine et al., 2005). Participants were divided randomly into two groups of three individuals each: Treatment Group 1 and Treatment Group 2 (Delayed Treatment Group). The mean (SD) age of Group 1 participants was 82 (8.7) years and Group 2 participants was 75 (1.0) years.

**Procedures**

**Group intervention.** The group intervention study (Lanzi, 2016) consisted of six consecutive intervention sessions. During the intervention, the examiner presented three categories of EMAs (i.e., calendars, timers, and personal information). The examiner dedicated two intervention sessions to explore each category. The three EMA categories included three
types of aids ranging from no to high technology approaches (as described below). The examiner provided each type of EMA for the participants to use during the intervention sessions. In addition, the participants could keep all of the aids, except the high-technology version (i.e., iPad), to use during home practice and following intervention. Although the participants were not given the iPad to use on their own, the examiner encouraged the participants to use their own cell phone or computer during home practice.

**Calendars.** The two types of no-tech calendars were in paper formats. 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 that hung on the wall, spanning 12x10 inches. The high-technology version of the calendar was accessed on an iPad. The electronic calendar provided monthly, weekly and daily views.

**Timers.** Low-tech timer options included 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 high-tech version of the timer/alarm was accessed on the iPad.

**Personal information.** Two no-tech options to record personal information included: 1) a 12-slot double-sided business card memory wallet provided to each participant; 2) the notes 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 high-tech version to record personal information was accessed on the Notes application of the iPad.

The examiner used the Sohlberg and Mateer (1989) three-step EMA training program (i.e., acquisition, application, and adaptation) throughout the intervention. During each treatment
session, the participants explored the features of each type of aid within the category (acquisition phase), completed role-play activities using the aids (application phase), and followed instructions regarding home-practice (adaptation phase). Following each session, the participants led the next session with discussion regarding home-practice using the aids previously trained. Each treatment session lasted approximately 90-minutes and was video recorded.

**Preference questionnaire.** The post-treatment questionnaire was used to obtain information about participants’ preferences and rationales for using, or not using, the types of EMAs within each category following intervention. The semi-structured questionnaire consisted of six open-ended questions and was administered by an examiner individually with each of the six participants (both Group 1 and Group 2) during a single 30-minute session following the conclusion of intervention. Each EMA category was discussed with two questions. The interviewer asked the participants (1) which type of aid she preferred within the category (i.e., calendar, timer, and personal information) and (2) to explain her rationale for this selection. Each individual session was video recorded and the examiner took notes during the sessions.

**Intervention video transcripts.** To examine participants’ experiences exploring, selecting, and implementing EMAs during intervention, the research assistants transcribed the six video files representing Treatment Group 1’s intervention sessions. The research assistants were trained on verbalization verbatim transcription (including emotional expressions, e.g., laughing). Following completion of training procedures, three research assistants were each assigned to review two of the six video files. Additionally, each research assistant conducted transcription reliability on two additional files; they calculated an overall mean agreement score of 94%, ranging from 92-97% for each transcript.
Data Analysis and Reliability

**Preference questionnaire analysis.** The researchers conducted a qualitative descriptive data analysis of the post-treatment preference questionnaire to examine the six participants' preferences following intervention. In addition to the notes, recorded by the interviewer, a research assistant transcribed the participant's answers from the video recording. The transcribers used the interview answer sheet to report which EMA the participant preferred and the rationale for the selection. The interviewer and research assistant compared answer transcriptions and reported 100% point-to-point agreement reliability.

**Intervention transcripts analysis.** To examine participants' experiences and attitudes while using the EMAs during intervention, the researchers conducted a thematic analysis of the six transcripts from Treatment Group 1’s intervention sessions. To analyze the six treatment session transcriptions, the researchers used the transcendental approach to phenomenology with triangulation (Creswell, 2013; Moustakas, 1994). The qualitative analysis approach was similar to that employed by previous researchers (Brown et al., 2017) who examined EMA preferences for individuals with acquired brain injury.

The members of the research team jointly analyzed a transcript to identify specific statements revealing information about the participants’ experience, attitudes, and opinions regarding the trained EMAs. Then the researchers developed narrower meaning units within the transcripts to later be used to represent themes present across the three participants within Treatment Group 1. Next, two members of the research team independently analyzed all subsequent transcripts and developed initial themes within the data using a coding sheet. The researchers then discussed emerging themes and developed a label and definition for each theme. The labels and definitions for each theme were added to a revised coding sheet. The research
members used the final coding sheet to reanalyze the transcripts independently and also identified key statements within the transcript that best represented the themes. Following the reanalysis, the researchers met to discuss any discrepancies and calculated an overall mean agreement score of 96%, ranging from 95-97% for each transcript.

**Results**

*Preferences Following Intervention*

To determine individual preferences regarding the types (high technology, low technology, and no technology) of EMAs within each category (i.e., calendars, timers, and personal information), the researchers reported qualitative data obtained from the post-treatment preference questionnaire. Most participants had a clear preference for one type of EMA.

In the *calendar* category, two participants preferred the paper daily view because the large amount of space allowed for entering the most amount of information compared to the other types. Four participants preferred the paper monthly type, because of the size and ability to plan by seeing the entire month in one view. In the *timer* category, all six participants preferred the clip-on timer due to its simple-to-use features and portability. To record *personal information*, two participants preferred the memory wallet due to its small size. In contrast, two participants preferred the planner, because of its portability and sufficient space to write details. Finally, the remaining two participants chose both the memory wallet and planner. The participants stated the rationale for choosing two types was due to the types of task and setting (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 the high-technology versions in any category trained during intervention.
Experiences During Intervention

In addition to examining participants' preferences following intervention, the researchers analyzed experiences during intervention obtained from qualitative analysis of transcripts representing Treatment Group 1’s intervention sessions. Qualitative analysis of the six treatment transcripts revealed five major themes: 1) positive reactions to EMA use; 2) negative reactions to EMA use; 3) adoption and modification of EMAs; 4) memory ability awareness; and 5) attitudes about technology. Although all participants had statements representative of each theme, there was variability based on unique needs and person-based situations. The variability was explored through the identification of sub-themes. Illustrative participant quotes are italicized and appear within parenthesis in the following sections.

Positive reactions to EMA treatment. Participants’ shared information revealed three subthemes regarding positive reaction to the treatment: (i) successful use of EMAs; (ii) helpfulness of EMAs; and (iii) sense of accomplishment. Each participant reported a positive reaction to using the EMAs in and outside of treatment sessions. For example, participants described successful use of the aids during role-play activities during treatment sessions. Participants reported more success using the aid during home practice following the second intervention session that was dedicated to training the EMA category. Participants often reported that the EMAs helped them in a situation during a home practice activity (e.g., “the personal information was helpful to me, where to put it and where to carry it”). Additionally, they often described feeling accomplished when using the EMAs outside of treatment (e.g., “just give me his name and phone number and there it was! In my wallet thing”).

Negative reactions to EMA treatment. Although the participants discussed many positive reactions to the EMA treatment, there were some negative feelings about the aids. The
analysis of the transcripts revealed three subthemes regarding negative reactions to EMAs: (i) hearing and vision limitations; (ii) not useful for the individual; and (iii) hesitation towards using the EMA. Hearing and vision limitations, due to natural aging, resulted in participants having negative reactions to the types of EMAs (e.g., “Well, if I could see it better, I would like it very much”). Throughout the sessions, there were also occasions for which the participants commented that they had no use for the EMA (e.g., “I don’t use the timer”, “I probably could but I don’t”. “My nose is a good timer if I’m cooking”). Participants were often hesitant during the first session to use new EMAs, but became more comfortable during the second session to explore the types of aids within the category.

**Adoption and modification of EMA.** Participants’ discussion of adopting and modifying the EMAs to fit their everyday needs revealed three subthemes: (i) personalization of the EMA; (ii) applying the EMA daily; and (iii) organization. Participants described the importance of establishing daily, routine use of EMAs (e.g., “the thing that has helped me the most is training myself to look at the calendar, to use the calendar regularly, on the daily basis”). The participants commented that the aid provided structure in their daily routine (e.g. “It forces me to be a little more organized, and to look ahead, and also to keep current. That I think was one of my biggest problems”). Participants often adapted what they learned in treatment and personalized the EMAs (e.g., color coding doctors’ appointments in their calendar and adding symbols to important calendar events) to accommodate their unique needs.

**Memory ability awareness.** Participants’ discussions during intervention resulted in three subthemes regarding memory ability awareness: (i) recognition of memory ability; (ii) remembering to use the EMA; and (iii) acceptance of memory. Participants frequently commented on what they had remembered or forgotten throughout the week and how the EMAs
were helpful when used daily (e.g., “I try to write things down on the calendar. My problem is I forget to look at it.”). Progression through the weekly sessions demonstrated a transition from recognizing their memory challenges to learning how to cope with them, and eventually accepting their memory abilities towards the end of intervention.

**Attitudes about technology.** Participants expressed (i) frustration, (ii) needing more practice and (iii) excitement when using EMAs involving technology. A lack of familiarity and problem-solving skills resulted in the participants feeling frustrated (e.g., “it gave me trouble because I was trying to set an alarm, and I hit that button and it went to T2 (a location outside of the alarm)”). Participants often expressed wanting more practice with technology. Following success with technology, the participants frequently expressed excitement. These positive and exciting feelings increased throughout the intervention sessions.

**Discussion**

The use of an EMA is an evidence-based approach that has been shown to support individuals with neurocognitive disorder by enhancing performance completing everyday tasks. The current study aimed to add to the limited literature base on the EMA preferences of older adults with mild memory impairments/possible mild neurocognitive disorder following intervention. Additionally, the researchers aimed to explore participants' experiences during a group-based intervention that trained several EMAs. Although it is important to examine the functional effects following EMA training, individual preferences must be explored to help researchers and clinicians appropriately develop compensatory strategy-based interventions. Therefore, the current study’s findings intend to support a person-centered approach throughout the continuum of EMA interventions.
Preferences Following Intervention

The results from the post-treatment questionnaire highlight the importance of supporting individual differences because most participants did not prefer the same type of aid within each category. Additionally, the results support the importance of considering an individual's sensory needs and environment during the EMA development phase.

Individual differences. Unlike previous strategy interventions, the group intervention (Lanzi, 2016) trained the participants on several types of EMAs within one category. In the calendar category, the participants preferred either the no-tech monthly or planner version. Although the participants’ demographic characteristics were similar, differences existed amongst their preferences to record and view information within the calendar. Similar to previous research findings (Brown et al., 2017) participants considered the space to record information when determining the preferred type of EMA. Some individuals preferred an aid that had enough space to record a large amount of daily information and other participants preferred to have enough space to view the entire week. Regardless of the preferred EMA, space to record information was an important consideration.

Differences also existed within the participant's preferred method to record personal information. In fact, two participants chose to use the memory wallet and the planner, and stated their selection depended on the type of information that needed to be recorded. This finding supports the practice of providing individuals with multiple types within one EMA category. Until the field gains a better understanding of how individual preferences impact use, clinicians and researchers should allow the individual to choose the type of EMA to ensure maximum success for a variety of everyday tasks. Clinicians can also provide guidance based on the predicted progression of impairments.
**Considering sensory impairments.** The majority of participants differed on the types of strategies preferred; however, all six participants preferred the clip-on version within the timer category. The participants stated their rationale for choosing this type of aid was due to the convenience, size, and volume level. In comparing the clip-on version to the other types within the timer category, the distinguishing features are the ability to wear this aid paired with simple access components. The participants reported that the other types were difficult to hear and were unreliable. Additionally, the participants’ changes in hearing impacted their ability to hear the iPad and manual timer when it was out of reaching distance. Therefore, when choosing and designing EMAs it is critical to consider changes in sensory abilities and easy to use operation features to decrease the cognitive and sensory burden when utilizing the strategy.

**Independent living.** A unique feature of the group intervention study (Lanzi, 2016) was that the participants lived by themselves at a senior retirement apartment complex. The participants in similar group intervention studies (Bourgeois, 2013; Kinsella et al., 2009) also completed activities of daily living independently, but did not live alone. In addition, a proxy who either lived or was closely associated with the individual also participated in the study. This contrast with previous studies is important because the participants in the current study were solely responsible for completing activities of daily living independently. Therefore, the aids needed to be both portable and support a variety of activities. Previous researchers have also identified the importance of utilizing small portable aids, regardless of the type of cognitive impairment experienced by an individual (Brown et al., 2017; Cohen-Mansfield et al., 2005).

Participants in the current study stated that the EMA needed to be useful in a variety of environments (e.g., home, doctor’s appointment, and shopping mall). One possible reason for this finding may be due to the fact that the participants of the current study were solely
responsible for completing their activities of daily living independently. Previous researchers suggest that the number of strategies used by individuals is related to their level of independence (Wilson, 1991). This finding is also similar to the discussion by Scherer and colleagues (2005) who emphasized the importance of considering one’s environment when designing strategies. Current strategy development practices do not support continued strategy use within one's environment. Therefore, a large majority of participants never maintain use of strategies following intervention (Scherer, 2005). If researchers and clinicians intend for the trained strategy to be used within community settings, then continued research is needed to develop appropriate methods to investigate the effect of personalization on EMA use.

**Experiences During Intervention**

The current study not only adds to the limited literature on individual EMA preferences, but also provides insight into the participants' experiences during the intervention where they were provided with hands-on trials with the aids. The five major themes that emerged primarily relate to the preference findings from the post-treatment questionnaire. In addition, the qualitative data analysis provides more information as to why participants did not prefer the high-tech versions of the aids and describes the benefits of a group-based training.

**Individual differences.** The theme of *positive reactions to EMA treatment* highlights the importance of training these types of strategies to individuals with probable mild neurocognitive disorder. However, the themes of *negative reactions to EMA treatment* and *adoption and modification of EMAs* depict the need to personalize the strategies for each individual. For example, one participant discussed how the manual timer is not useful for her because she uses the timer on the microwave. Also, the specific subtheme of *personalization of the EMA* emerged. The participants made several comments related to specific ways she adapts the aid based on her
unique needs. One participant, for example, used a check mark to indicate completion of an event within her calendar. These findings further support introducing an individual to several types of EMAs and encouraging specific features to enhance strategy personalization.

**Considering sensory impairments.** Although individuals had negative reactions to the EMA treatment several comments focused on normal aging sensory impairments. For example, one participant stated, “Well, if I could see it better, I would like it very much.” Previous researchers who investigated preferences of older adults also reported several physical limitations, such as, accessing the aids (Cohen-Mansfield et al., 2005). The negative reactions to the strategies regarding sensory impairments are critical for researchers and clinicians to address when designing strategies. Several strategies can be adjusted to accommodate normal aging sensory impairments; however, more research is needed documenting these accommodations.

**Attitudes about technology.** The findings from the post-treatment questionnaire reported that the participants did not prefer the high-tech versions within any EMA category. This preference is not uncommon, as previous researchers (Evans et al., 2003) reported 79.5% of participants with brain injuries preferred low-tech types of aids. The qualitative analysis of the intervention transcripts revealed a theme entitled *attitudes about technology*. The participants discussed becoming frustrated when they were unsure how to operate the electronic EMA. They also discussed that they did not have enough practice using the high-tech versions of the aid. This could possibly be due to the limitation of not providing the participants with the high-tech versions during home practice. Interestingly, the participants reported being excited when they operated the high-tech version successfully.

Previous researchers have also found that most older adults are interested in learning how to use electronic EMAs, however, their level of familiarity with the device often predicts
successful use (Cohen-Mansfield et al., 2005). The associated group intervention study (Lanzi, 2016) did not examine how the individuals operated high-tech devices prior to the intervention. Therefore, when the examiner introduced the high-tech version of the aid most of the intervention time was spent on basic operation features. Future research should examine a participant's familiarity with a device and skills prior to intervention.

Another important consideration is the possible effect of a participant's age on preferred (electronic or non-electronic) EMAs. The mean age of the participants in the current study was 82 years old (Range= 72-88 years). Previous research related to preferences of individuals with acquired brain injury has reported that the participants often preferred electronic EMAs (when presented with several types) and have a high comfort level using electronic devices (Brown et al., 2017; Bourgeois, 2003). However, the mean age of the participants in the Hart et al (2004) study was 31.5 years (Range=17 to 70 years) and in the Brown et al (2017) study was 26 years (Range=19 to 39 years). Therefore, the reason for the differences in preferences may relate to the age of the individuals rather than etiology. Future research should explore methods for supporting individuals who may be less familiar with technology and consider ways to best support individuals who are more familiar with technology (Wallace, Graham, & Saraceno, 2013).

**Group-Based intervention.** Unlike the post-treatment preference questionnaire data analysis, the qualitative analysis of the intervention transcripts examined the participants as a group. Previous preference research has only conducted data from individuals rather than in a group setting. Therefore, themes emerged regarding the impact of individuals participating in a group intervention. Specifically, the participants discussed how they would adapt an aid based upon another group member’s suggestion. The participants also made several statements related
to memory ability awareness. Statements from the participants discussed an initial recognition of their memory ability and this could possibly be due to the support that working in a group naturally provides. Future research should possibly examine the impact of individual versus group training delivery on EMA preferences.

Limitations

Although the presented study supports further research examining individual strategy preference, several factors limit the interpretation of the results. The study reported the preferences of only six participants following intervention and three participants during intervention. In addition, the participants represented a homogeneous group with limited representations across demographic factors (e.g., race and sex). All participants were females and resided in the same senior apartment complex. It is possible that gender could affect individual preferences and similar living experiences could enhance comfort levels during the intervention impacting one’s overall experience.

The researchers of associated group intervention study (Lanzi, 2016) also did not require participants to have a formal diagnosis of mild neurocognitive disorder by a medical physician; rather the inclusion criteria incorporated the DSM-V criteria (American Psychiatric Association, 2013). Although the inclusion criteria were described and included a community-based sample of individuals with mild memory impairments/possible mild neurocognitive disorder, the preferred support characteristics may not generalize to individuals with an official diagnosis of mild neurocognitive disorder made by a physician. Future research should consider if an official diagnosis may impact one’s experience and preferences towards strategy characteristic as opposed to a community-based sample.
Conclusions

Clinicians and researchers often use person-centered evidence-based approaches to implement EMAs; however, these approaches are rarely used to choose and design such strategies prior to intervention. Findings from the presented study support the need to implement person-centered approaches into the design phase of EMAs because individuals have unique needs, comfort levels, and experiences that impact overall use of the strategies. Current practice highlights a disconnect between intervention and direct application to functional daily activities; therefore, individuals with neurocognitive disorder often do not maintain strategy use following intervention (Scherer, 2005). The current study's findings aim to assist clinicians and researchers with implementing a person-centered approach throughout the continuum of strategy development, choice, modification, implementation, and generalization for older adults with mild memory impairments/ possible mild neurocognitive disorders.

References


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


Brown, J., Hux, K., Hey, M., & Murphy, M. (2017). Exploring cognitive support use and
preference by college students with TBI: A mixed-methods study. *NeuroRehabilitation, 41*(2), 483-499.


Hoerster, L., Hickey, E. M., & Bourgeois, M. S. (2001). Effects of memory aids on conversations between nursing home residents with dementia and nursing...


CHAPTER FOUR: STRUCTURED EXTERNAL MEMORY AID TREATMENT FOR MILD COGNITIVE IMPAIRMENT

Note to Reader

Portions of this chapter are in press in American Journal of Speech-Language Pathology and have been reproduced with permission from Origin Editorial.

Introduction

As individuals age, cognitive changes become evident and may interfere with everyday tasks. Although changes are expected during normal aging, some individuals experience cognitive impairments that decrease their speed and efficiency to complete complex activities of daily living. In America, approximately 20% of older adults are living with symptoms of Mild Cognitive Impairment (MCI; Roberts et al., 2012). Individuals with MCI can complete activities of daily living independently; however, because their memory impairments exceed those of normal aging they may rely on compensatory strategies to complete daily tasks (DSM-V, American Psychiatric Association, 2013; Petersen, 2004).

Since 2013, the DSM-V has included MCI within the neurocognitive disorder (NCD) diagnostic category. Mild and major NCD classifications are based on severity of cognitive impairments and completion of activities of daily living (American Psychiatric Association, 2013). Although individuals within the mild NCD (mNCD) classification rely on compensatory strategies to maintain independence while completing daily tasks, limited measures are available that measure one’s strategy use in everyday tasks. In addition, individuals with mNCD are at greater risk than normal aging peers for their impairments progressing to the major classification.
However, the rate of progression and presentation of symptoms vary by individual and the tools used to measure these changes. Most assessments of cognitive skills, such as the Montreal Cognitive Assessment (MoCA; Nasredine et al., 2005) and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, Tierney, Mohr, & Chase, 1998), measure performance on cognitive tasks that do not reflect everyday tasks. For example, on the MoCA, to measure attention, individuals listen to a list of letters and respond when a specific letter is stated. To date, there is not a functional performance measure that examines one's daily use of compensatory strategies to support their cognitive challenges. It is important to know what compensatory strategies might be effective early in the progression of cognitive symptoms, such that, individuals can be encouraged or trained to use them more consistently over time and modify them to maximize effectiveness.

Compensatory strategies are commonly taught to individuals with cognitive impairments because they reduce the burden of the impaired processes by providing alternative access routes to stored information needed to complete tasks (Lanzi, Burshnic, & Bourgeois, 2017). Many types of compensatory strategies exist; calendars, timers, weekly planners, and memory notebooks are examples of external memory aids (EMAs) that are commonly used to enhance daily task performance (Bourgeois, 2013; Lanzi et al., 2017; Sohlberg & Mateer, 2001). Most of the compensatory strategy intervention studies have used a group format for teaching strategy use (Bourgeois, 2013; Greenaway, Duncan, & Smith, 2012; Kinsella et al., 2009). Although these studies provide evidence that individuals with mNCD can learn to use strategies, the participants rarely maintain skills following intervention. Poor maintenance could possibly be due to the lack of treatment emphasis on using preferred strategies and/or the measures used to examine strategy use and functional behavior.
For example, Greenaway and colleagues (2012) examined the effectiveness of training a researcher-developed Memory Support System, as an EMA, through a randomized control trial of 40 individuals with mNCD. The Memory Support System consisted of a pocketsize calendar and note taking system and was divided into three sections: (1) appointments, (2) “to do” items, and (3) journaling. Intervention was delivered to individuals with MCI and their caregiver and included 12, 1-hr sessions across three weeks. The researchers measured improvements in activities of daily living using an informant-based memory scale: The Measurement of Everyday Cognition (Farias et al., 2008). Participants increased activities of daily living following intervention and 8 weeks later. However, improvements were not maintained 6-months post intervention. In addition, the researchers measured adherence to the Memory Support System (e.g., a point was scored if participants brought in the system). Participants reported increased adherence immediately following intervention and 8 weeks later. These improvements were not maintained 6-months post intervention. The adherence measure developed by the researchers provided insight into the participant’s actual use of the trained strategy, which is important to document treatment effects. However, the researchers failed to examine the effects of using the strategy to enhance performance of everyday activities. Rather the researchers used an informant-based tool to document the participants’ functional behavior. To better understand the functional effects of compensatory treatments, researchers need to include measures that simulate everyday tasks and examine strategy use.

Kinsella and colleagues (2009) developed a group treatment using a problem-solving approach for memory impairments. In five treatment sessions, 52 individuals with MCI learned about several strategies: external and internal memory aids, strategies for organizational and attention skills, general coping skills, and the multifactorial construct of memory. The large
number of strategies taught provided limited opportunities for participants to tailor the strategies to their unique needs. Therefore, the focus of the intervention was on exposure to strategies rather than use of preferred strategy types. To measure prospective memory, the researchers used the Reminder Task and Envelope Task (Huppert, Johnson, & Nickson, 2000; Wilson et al., 2008). A significant medium-size group effect was reported on the prospective memory tasks at both 2 weeks’ and 4 months’ follow-up assessments. The prospective memory measures used in the study were performance-based and reflective of everyday tasks. Therefore, the results obtained from the measures provided insight into the participants' functional behavior. However, the measures did not examine the participants' strategy use within the everyday tasks. The researchers administered the Multifactorial Metamemory Questionnaire to measure self-reported memory strategy use (Troyer & Rich, 2002). The participants’ self-report of strategy use improved 2-weeks following intervention, however, the improvements were no longer statistically significant 4-months later. It is possible that the exposure to multiple memory strategies, both internal and external, could have limited participants’ experience with a single strategy that they might have adopted for daily use. Thus, we should investigate interventions that prompt participants to tailor EMAs to meet their own daily needs and residual strengths. In addition, the researchers discussed the limitations of using self-report measures; specifically, that many self-report tools are confounded by subjective beliefs of memory and negative stereotypes about age-related memory changes (Kinsella et al., 2009). Therefore, studies that use functional performance-based measures to examine strategy use to document treatment effects are needed.

Lanzi, Wallace, and Bourgeois (2018a) examined the effects of teaching three categories of EMAs (calendars, timers, and personal information) to six individuals with possible MCI in a group format for six weeks. The researchers taught the EMAs using Sohlberg and Mateer’s
(1989) three-step training program, in which they (1) explored several examples of EMAs within each category, (2) role-played using the EMAs in everyday situations, and then (3) used the aids in their home environment. The researchers encouraged the participants to tailor the strategies to their individual needs and select their preferred EMAs in hopes that they would continue to use them beyond the intervention period. The researchers developed the Role Play Activity Assessment to document strategy use in tasks representative of activities of daily living.

Following intervention, participants demonstrated an overall increase in EMA use on the Role Play Activity Assessment. Participants also reported statistically significant differences from pre- to post-treatment on the MMQ-Strategy, confirming the positive impact of treatment on self-reported functional strategy use. In addition, the researchers assessed the participants in Group 1 six-weeks following intervention and most individuals maintained strategy use on the Role Play Activity Assessment. Eighteen months following intervention, however, only some individuals maintained their skills; an overall mean decrease on the Role Play Activity Assessment and MMQ scores were reported. Although the researchers reported an overall mean decrease, only one participant’s Role Play Activity Assessment score deviated by more than one point. Thus, this study provides evidence for using a roleplay-based measure to examine participants’ strategy use in everyday tasks.

Unlike similar studies, Lanzi et al. (2018a) limited the number of EMAs taught and encouraged participants to choose their preferred strategies throughout intervention. In a follow-up study, Lanzi, Wallace, and Bourgeois (2018b) examined the EMA experiences and preferences of the participants during and following intervention. The researchers analyzed the participants’ experience using EMAs during intervention from transcripts of video-recorded treatment sessions. Analysis revealed 5 major themes: (1) positive reactions to EMA use; (2)
negative reactions to EMA use; (3) adoption and modification of EMAs; (4) memory ability awareness; and, (5) attitudes about technology. The researchers elicited participants’ EMA preferences following intervention from a post-treatment preference questionnaire. Results revealed unique preferences amongst individuals within each EMA category. These results highlight the unique differences of participants’ EMA use and preferences across all three categories taught and the importance of considering personal factors when designing EMAs.

In summary, evidence for the effectiveness of teaching the use of EMAs as a compensatory strategy-based memory intervention is accumulating. The reviewed literature highlights the need to design interventions that encourage participants to tailor EMAs to their own needs, spared strengths, and personal preferences. Additionally, researchers need to continue to explore the use of roleplay-based measures to document functional behavior and strategy use. Thus, the purpose of the current study was to explore the effects of a structured external memory aid treatment on the participants’ strategy use during the Roleplay Assessment representative of several functional everyday tasks.

**Research Questions**

1. What is the effect of a structured external memory aid treatment for individuals with possible mNCD on their use of external memory aids to compensate for memory impairments?

2. To what extent does improved functional external memory aid use due to structured treatment for individuals with possible mNCD maintain following intervention?

3. What is the effect of a structured external memory aid treatment for individuals with possible mNCD on their self-reported memory skills?
Methods

Participants

The participants in the current study represented a community-based sample of older adults with possible mNCD (according to the DSM-V criteria); evidence of cognitive decline from a previous level of performance (i.e., individuals self-reported mild memory impairments and documented mild memory impairments on an objective cognitive measure), independent completion of activities of daily living, and cognitive decline is not due to delirium or another disorder (American Psychiatric Association, 2013). Approximately 25 older adults from a senior community center in St. Petersburg, Florida met with the researchers and completed initial recruitment procedures. After explaining the study and conducting screening procedures, the researchers determined that six individuals met inclusion criteria. Participants’ MoCA score (Nassredine, et al., 2005) confirmed the presence of self-reported memory loss in the range of mNCD (Peterson, 2004); participants scored within the range of 18-25 (mean score=21; refer to Table 4.1). Exclusion criteria included: self-reported history of depression or psychiatric illness that resulted in hospitalization within the last two years, history of learning or language impairments, history of stroke or brain injury, and non-English speaker. The six female participants' ages ranged from 64-89 years old. All participants passed a functional hearing, vision, and communication screening (Bourgeois, Dijkstra, Burgio, & Allen-Burge, 2001) and completed informed consent procedures (using the University of South Florida institutional review forms). As shown in Table 4.1, participants were randomly assigned to one of three dyads (composed of 2 participants).
### Table 4.1. Participant Demographics.

<table>
<thead>
<tr>
<th>Dyad</th>
<th>Participant</th>
<th>Age (years)</th>
<th>Years of Education</th>
<th>MoCA Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P1</td>
<td>77</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>P2</td>
<td>78</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>77.5</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>P3</td>
<td>71</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>P4</td>
<td>77</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>74</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>P5</td>
<td>89</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>P6</td>
<td>64</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>76.5</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Overall Mean</td>
<td>76</td>
<td>15.3</td>
<td>21</td>
</tr>
</tbody>
</table>

**Measures and Materials**

**Screening measures.** Participants completed a demographic form to provide self-reported medical history and information regarding activities of daily living. The researcher assessed sensory impairments using the *Functional Hearing, Vision, and Communication Screening Measure* (FunctHVC; Bourgeois et al., 2001). During the administration of the FunctHVC, the researcher observed each participant during a conversation and scored the sensory areas (i.e., hearing, vision, and communication) on a scale of intact to severely impaired.

**Dependent measures.** The primary dependent measure was the *Roleplay Assessment*. Each participant could score a maximum of 14 points on the *Roleplay Assessment*, representing successful use of EMAs to complete three everyday tasks (refer to Appendix C). At the start of
the assessment, the participant was told she could use any of the EMAs on the table (i.e., notepad, calendar or iPad) to help complete the three tasks.

**Task one** required the participant to remind the researcher to complete an activity (e.g., return a phone call) in two minutes. One point was marked on the scoring sheet if the participant used one of the EMAs on the table, such as setting a timer. A score of 0 was marked if the participant did not do anything with the EMAs on the table. An additional point was marked on the scoring sheet if the participant reminded the researcher of the task in two minutes.

**Task two** was a voicemail retrieval task in which the participant heard a pre-recorded 40-second voicemail about an upcoming event (e.g., doctor appointment). Prior to playing the voicemail, the researcher informed the participant that she would be asked questions immediately following the recording. The researcher asked seven wh-questions about facts from the recording (e.g., What is the doctor’s name?) and used the scoring sheet to record recall accuracy (accurate/inaccurate; possible scores: 0-7) and strategy use during the task (one point was marked on the scoring sheet if an EMA was used). The maximum score for the voicemail section was eight: indicating accurate responses to the seven wh-questions and use of a strategy.

**Task three** examined each participant's calendar use. Prior to the assessment, each participant was asked to bring her personal calendar to the next session. During task three, the researcher asked the participant to see her calendar (one point was awarded if calendar was brought to session). The researcher also asked the participant to show three documented events within the last two weeks. One point was scored for each event documented (maximum of three points).
To reduce the test-retest effects on repeated administrations of the *Roleplay Assessment*, multiple versions of the task prompts were made. The structure of the three tasks did not change, rather the content (e.g., doctors appointment vs. birthday party) within the tasks differed.

To assess the participants' self-reported memory skills and use of external memory aids/strategies across three dimensions (i.e., ability, strategy, and contentment) the researchers administered the *Multifactorial Memory Questionnaire* (MMQ; Troyer & Rich, 2002). The MMQ is composed of 57 questions that are independently answered using a five-point Likert scale (“all of the time” to “never”). The researchers of the current study modified the MMQ for normal age-related sensory changes by increasing the font size, spacing, and page orientation of the questionnaire.

**Treatment materials.** The intervention stimuli consisted of three categories of EMAs (calendar, timer, and personal information). Within each category, EMA types ranged from no-tech to high-tech aids. The researchers provided the aids for participants to use and keep during and following treatment. In addition, the researchers encouraged participants to bring in their own EMAs within each category (if used).

**Design and Procedures**

The study implemented a multiple baseline design across subjects within dyads to examine the participants’ use of EMAs to compensate for memory impairments. The experimental sessions consisted of three phases: baseline phase, treatment phase, and maintenance phase. The participants completed assessments individually; however, they received treatment sessions in dyads to provide a group dynamic during intervention. The researchers also employed a pre-post experimental design to examine the participants’ self-report of metamemory skills following treatment using the MMQ.
**Pre-Treatment assessment.** During the pre-treatment assessment session, the researchers administered the screening measures (i.e., interview guided by the demographic form, MoCA, and FunctVHC). All participants scored within normal limits on the FunctVHC. After participants met criteria for study participation, the researchers administered the modified version of the MMQ.

**Baseline phase.** Following the pre-treatment assessment session, all six participants began baseline data collection. At the start of each baseline session the *Roleplay Assessment* was administered individually to the participants. When stability in baseline data was observed (i.e., absence of improving trend, minimum variability, and generally low level across a minimum of three sessions) by visual inspection of the graphed *Roleplay Assessment* scores, treatment began for dyad 1 and the other two dyads remained in the baseline phase. During each session within the baseline phase, the participants continued to complete the *Roleplay Assessment*. Due to the multiple baseline design, each dyad’s baseline phase was increasingly longer than the previous dyad’s (dyad 1= 3 baseline phase sessions; dyad 2= 5 baseline phase sessions; dyad 3=7 baseline phase sessions).

**Treatment phase.** Following the administration of the *Roleplay Assessment*, treatment sessions began in dyads. Each dyad completed four weekly sessions lasting approximately one-hour within the treatment phase. Treatment was continued until a treatment effect for dyad 1 was observed (i.e., positive change in level and minimal variability). Treatment sessions then began with the next dyad whose baseline data was observed as low and stable (dyad 2). This procedure was repeated until all 3 dyads completed the intervention sessions. To examine the treatment effect at the start of treatment sessions 2-4, the researcher administered the *Roleplay Assessment* individually to the participants.
During the treatment sessions, the researcher followed a treatment protocol and taught three categories of EMAs (i.e., timers, calendars and personal information). Each weekly session was dedicated to one EMA category and within each category several types of aids were discussed (refer to Table 4.2 for the treatment schedule). For example, within the personal information category the researcher discussed a small notepad, a memory wallet, and a dry erase board. Similarly to Lanzi et al. (2018a), the EMAs were taught in three-phases: acquisition, application, and adaptation (Sohlberg & Mateer, 1989). The following section describes the integration of the three-phases into the weekly treatment sessions within the current study.

**Table 4.2. Treatment Schedule.**

<table>
<thead>
<tr>
<th>Treatment Session</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMA Category</td>
<td>Calendar</td>
<td>Timer</td>
<td>Personal Information</td>
<td>Review</td>
</tr>
</tbody>
</table>

During treatment session one, the researcher explained the overview of the treatment and provided rationale for meeting in dyads (e.g., to share ideas of how to modify the EMAs). Then, the researcher described how three categories of EMAs would be trained throughout the sessions and explained how the participants are encouraged to try multiple types within each EMA category and share ideas throughout the sessions.
Next, the EMA category for the week was introduced during the \textit{acquisition phase} (refer to Appendix D). During this phase, the participants explored multiple types of EMAs within each category. To enhance exploration, the participants and researcher discussed how to use different EMA types and what situations would be appropriate and inappropriate for using the aid. For example, when discussing the monthly paper calendar, the participants described the benefit of having opportunities to plan and look ahead but also discussed the difficulty of being unable to travel easily with it due to the size. Each participant shared their previous or lack of experiences using the types of aids within each category during the \textit{acquisition phase}.

Following the discussion of the EMA types, the participants engaged in the \textit{application phase} to promote hands-on functional practice with the strategies. This phase involved several simulated scenarios (approximately 3) using the different types of EMAs. For example, the researcher stated, “Show me how you would use the calendar to document the information from this birthday invitation.” The participants were encouraged to complete the tasks with each EMA type to facilitate a discussion on the pros and cons of each different strategy. The dyad format facilitated discussion between participants on successful/unsuccessful scenarios and possible personal modifications to enhance EMA use in the home environment. One participant, for example, placed sticky-notes on her calendar when she needed to bring something with her to later place it on the door as a reminder.

To facilitate functional EMA use outside of treatment the researcher introduced the \textit{adaptation phase}. During this phase, the participants were encouraged to use the trained EMAs within their natural environment. For example, at the end of the session the researchers reviewed a home practice handout with the participants. The handout asked the participants to use the
EMAs and reflect upon their experiences throughout the week. All of the participants completed the home practice activities throughout the intervention.

At the start of the following session, the participants discussed their home practice experiences with the previous week’s EMA category. The participants provided each other with suggestions and shared examples of positive and negative experiences using the EMAs to complete everyday tasks. In addition, the participants discussed how they tailored the EMAs to meet their own unique needs, incorporated the EMA into their daily routine, and provided rationale for specific preferences amongst the types of strategies.

**Maintenance phase.** Following the treatment phase, dyads 1 and 2 completed monthly maintenance phase sessions to examine the retention of strategy use. During the maintenance phase the participants completed the *Roleplay Assessment* independently.

**Post-treatment assessment.** To examine the changes in self-report of metamemory skills following intervention the participants completed the MMQ immediately following the conclusion of the treatment phase sessions.

**Reliability**

**Inter-Rater reliability.** To examine reliability of the dependent measure a second rater was trained by the researcher to record data on the *Roleplay Assessments* while watching the session video recordings to a rate of 80% agreement with the researcher. Then the rater scored 20% the assessments independently. Inter-rater reliability was calculated by dividing the total number of both raters’ *Roleplay Assessment* score in agreement by the total number of raters’ agreements and disagreements; 92% (range = 90%-94%) point-to-point agreement was obtained.

**Fidelity.** To examine treatment fidelity, a student independently scored 20% of the treatment sessions. The rater used a checklist (from the treatment procedure manual) while
watching the treatment videos to score fidelity of the intervention. The rater used the checklist to document how successfully the researcher followed the treatment protocol during the intervention sessions. Overall, the rater reported 92% researcher adherence to the treatment protocol (range = 87-95%).

**Results**

**Functional Use of EMAs**

As can be seen through visual inspection of Figure 4.1, all participants demonstrated a treatment effect, from generally low, stable scores in baseline to an immediate increase and positive trend in the scores during treatment with no overlapping data between phases. In baseline, there is limited variability across all participants’ data. The overall level of baseline is different for each participant, reflecting EMA use prior to intervention for some participants. However, the level of the data for each participant within the dyad is similar.

As each dyad began treatment, a large positive change in level of the data was present, indicating a treatment effect. To further support this conclusion, the researchers analyzed the baseline phases of the remaining dyads. As the treatment for each preceding dyad began, the subsequent dyads’ baseline data remained stable. Therefore, the change in the level of data is concluded to be due to treatment effects rather than extraneous variables or a practice effect.

To further evaluate the treatment effects, the researchers conducted non-overlapping indices: Tau U=1.0. The researchers also ran a multilevel regression model to estimate effect sizes, restricted maximum likelihood estimation, and Kenward-Roger adjusted degrees of freedom and standard errors using SAS 9.4. This approach has been shown to lead to valid average effect size inferences (Ferron et al., 2009). In addition, this approach provides valid
individual effect size inferences (Ferron, Farmer, & Owens, 2010) in the context of multiple-baseline studies with as few as four participants.
Figure 4.1. The score on the Roleplay Assessment across baseline, treatment, and maintenance sessions for each of the three dyads.
The researchers examined the average treatment effect (i.e., fixed effects) across dyads and the variability of this estimated effect between cases (i.e., random effects) within dyads using a two-level model. The data within Tables 4.3 and 4.4 can be compared to the visual analysis of the graphs to further confirm the researchers' conclusions. The values in Table 4.3 represent the across case and time average number of functional EMAs used during baseline (i.e., 4.00) and the across case average shift in the number of functional EMAs that occurred with treatment (i.e., 7.03), which indicates during treatment the across case average number of functional EMA’s is 11.03. The standard errors and confidence intervention are also presented in Table 4.3 for each average estimate.

**Table 4.3.** Fixed Effects: Average Treatment Effect Across Dyads.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept (Baseline Level)</td>
<td>4.00</td>
<td>1.29</td>
<td>(-1.55-9.54)</td>
</tr>
<tr>
<td>Phase (Treatment Level)</td>
<td>7.03</td>
<td>1.03</td>
<td>(2.50-11.55)</td>
</tr>
</tbody>
</table>

Note. Estimates of the variance components: Intercept dyad=4.82 and person(dyad)=0.17; Phase dyad=2.19 and person(dyad)=1.34. autocorrelation=-0.05; within-case variance=1.21. Tau-U=1.0

The values in Table 4.4 are the empirical Bayes (EB) estimates of the baseline level and treatment effect for each participant. The treatment effects ranged from an increase of 5.26 functional EMA’s used by Participant 3 to an increase of 9.81 functional EMA’s used by Participant 1. These individual effects were obtained by adding the random effect for the dyad and participant to the fixed effect. The obtained values can be compared to the averages for further analysis for each individual parameter estimate.
Table 4.4. Random Effects (empirical Bayes): Variability of Estimated Treatment Effect Between Participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline Level</th>
<th>Shift in Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>3.12</td>
<td>9.81</td>
</tr>
<tr>
<td>Participant 2</td>
<td>2.86</td>
<td>7.68</td>
</tr>
<tr>
<td>Participant 3</td>
<td>6.53</td>
<td>5.26</td>
</tr>
<tr>
<td>Participant 4</td>
<td>6.47</td>
<td>6.71</td>
</tr>
<tr>
<td>Participant 5</td>
<td>2.20</td>
<td>5.93</td>
</tr>
<tr>
<td>Participant 6</td>
<td>2.80</td>
<td>9.31</td>
</tr>
</tbody>
</table>

**Maintenance**

As seen in Figure 4.1, the participants who received monthly follow-up sessions maintained functional strategy use following intervention on the *Roleplay Assessment*.

Overall, the data in the maintenance phase across all four participants overlaps the data collected in the treatment phase. Each participant retained EMA use, but for different increments of time. Participant 1 and 4 maintained strategy use for one-month, Participant 3 maintained strategy use for two-months, and Participant 4 maintained strategy use for three-months.

**Self-Perceived Strategy Use**

Researchers examined participants’ self-perceived memory skills by administering the MMQ (refer to Table 4.5). The participants’ mean scores on the MMQ-Contentment and MMQ-Ability decreased slightly from pre to post treatment (MMQ-Contentment=43.0 to 42.8; MMQ-Ability=41.6 to 40.3). These changes were not statistically different for either subtest. However, participants’ self-perceived use of strategies on the MMQ-Strategy subtest increased following treatment as indicated by a large increase in mean scores (pre-treatment mean=34.5; post-
treatment mean=43.5). This change was statistically significant (t=0.01, p<.05).

Table 4.5. MMQ Scores and Pre-Post Sub-Scale Comparisons.

<table>
<thead>
<tr>
<th>Pt. #</th>
<th>Contentment Pre-Tx</th>
<th>Contentment Post-Tx</th>
<th>Ability Pre-Tx</th>
<th>Ability Post-Tx</th>
<th>Strategy Use Pre-Tx</th>
<th>Strategy Use Post-Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt. 1</td>
<td>25</td>
<td>37</td>
<td>34</td>
<td>38</td>
<td>31</td>
<td>39</td>
</tr>
<tr>
<td>Pt. 2</td>
<td>55</td>
<td>52</td>
<td>53</td>
<td>58</td>
<td>41</td>
<td>43</td>
</tr>
<tr>
<td>Pt. 3</td>
<td>49</td>
<td>46</td>
<td>44</td>
<td>42</td>
<td>35</td>
<td>47</td>
</tr>
<tr>
<td>Pt. 4</td>
<td>52</td>
<td>30</td>
<td>47</td>
<td>36</td>
<td>38</td>
<td>42</td>
</tr>
<tr>
<td>Pt. 5</td>
<td>57</td>
<td>56</td>
<td>55</td>
<td>49</td>
<td>19</td>
<td>37</td>
</tr>
<tr>
<td>Pt. 6</td>
<td>20</td>
<td>36</td>
<td>17</td>
<td>19</td>
<td>43</td>
<td>53</td>
</tr>
<tr>
<td>Mean</td>
<td>43.0</td>
<td>42.8</td>
<td>41.6</td>
<td>40.3</td>
<td>34.5</td>
<td>43.5*</td>
</tr>
</tbody>
</table>

*Note. *p < 0.05

Discussion

The current study used a multiple baseline single subject design to evaluate the effects of a structured group EMA treatment on (1) functional strategy use during a role-play assessment, (2) retention of strategy use and (3) self-perceived memory skills.

Functional Strategy Use

Following intervention, a treatment effect was observed as indicated by a large positive change in level of functional strategy use on each individual’s graph. The empirical Bayes estimates further confirm the positive increase in strategy use across all participants. Therefore, individuals with possible mild NCD can learn to use EMAs when provided structured group instruction. This finding is similar to previous studies with individuals with MCI (Bourgeois, 2013; Greenaway et al., 2012; Kinsella et al., 2009).
Similar to Lanzi and colleagues (2018a) the researchers used a measure that consists of roleplay-based activities to document treatment effects. The Roleplay Assessment in the current study depicts several functional situations. Therefore, an increase in performance is likely to reflect positive changes in one’s ability to complete everyday cognitive communication tasks. Thus, this study provides evidence for using a functional measure to examine treatment impact on everyday skills.

These findings are similar to previous research examining the effect of cognitive rehabilitation on everyday skills using performance-based functional measures. Specifically, Schmitter-Edgecombe and Dyck (2014) measured changes in everyday abilities through assessments that examined functional skills (i.e., medication management and bill paying). They also reported positive changes on such performance-based tasks following intervention. These findings suggest a possible increase in everyday performance of daily tasks; however, it is unclear how these measures translate to functional skills. A unique component of the Roleplay Assessment used in the current study is the tasks within the measure are performance and adherence based. After exploring the individual scores within each task section, only one participant actively used a calendar during the baseline phase. Following treatment, all six participants had and used a calendar to document weekly events. This finding, reveals that the participants used the taught strategy in everyday life. Future research should explore additional methods of measuring strategy use in daily tasks.

The researchers of the current study not only expanded upon the Lanzi and colleagues’ (2018a) Role Play Activity measure to examine a variety of everyday tasks, but also explored individual differences using a multiple baseline design. As highlighted in previous research (Lanzi et al., 2018b) individuals have unique preferences and previous experiences that impact
functional strategy use. The different baseline levels across participants further confirmed this finding. Although the participants in dyad 2 were already using strategies prior to intervention, they still increased EMA use following intervention. Therefore, future research should explore individual strategy use prior to intervention to better tailor the EMAs to each individual’s needs, residual strengths, and previous experience with compensatory strategies.

**Maintenance of Skills**

Participants in dyads 1 and 2 were assessed in one-month increments following intervention to analyze the retention of functional strategy use. Overall, the participants maintained strategy use for 1-3 months following intervention as indicated by visual analysis. This finding is different from the results of Kinsella and colleagues (2009), because their participants did not maintain treatment effects after 2 weeks. The participants in the current study may have increased maintenance because of the limited number of strategies taught and multiple options provided to each participant that encouraged use of preferred EMAs during intervention. This finding emphasizes the need to provide person-centered interventions and continue to examine the long-term effects of personalized EMA interventions for individuals with mild memory impairments.

**Self-Perceived Strategy Use**

The researchers examined participants’ perception of memory skills through the MMQ (Troyer & Rich, 2002). The effects of the structured EMA intervention on self-perceived strategy use were documented for all participants on the MMQ-Strategy. Findings were similar to Lanzi et al. (2018a) in that participants reported daily strategy use as a result of EMA treatment. However, inconsistent findings on the other subtests (MMQ-Contentment and MMQ-Ability)
suggest a possible disconnect between self-report and performance-based measures. This finding is similar to previous research (Kinsella et al., 2009).

One explanation for the disconnect is the possible memory beliefs or negative stereotypes about aging memory of the participants (Kinsella et al., 2009). This idea suggests that although participants have a change in behavior they may need time for accurate self-appraisal of that change; they may not value the use of strategies; or they may think the use of strategies is a reflection of memory impairment. The large range in scores amongst participants, however, suggests that some individuals possibly recognized the change faster than others, or valued the use of strategies. Therefore, researchers need to continue to enhance participants’ awareness of the benefits of a strengths-based, strategy approach and to reduce negative stereotypes associated with aging. Researchers should also explore other methods of examining individual changes following treatment, such as quality of life measures.

Recent research has described the importance of exploring quality of life in older adults with mild memory impairments (Smith, Chandler, Fields, Aakre, & Locke, 2018). Smith and colleagues (2018) surveyed 82 couples (an individual with mild cognitive impairment and their partner) to examine outcome and intervention preferences. Participants ranked quality of life as the highest outcome priority and ranked memory compensatory training as the most valuable component of a multi-faceted behavioral intervention program. It is possible that compensatory based interventions that focus on person-centered components have an effect on quality of life (Smith et al., 2018). Future research should explore the relationship between compensatory interventions and the quality of life of individuals with mild memory impairments.
Limitations

The study examined a community-based sample; therefore, participants did not have a formal diagnosis of mNCD (even though the researchers used the DSM-V diagnostic criteria for mNCD to describe the participants). The lack of formal diagnosis limits the interpretation of the data and may explain some of the inconsistencies across follow-up performance. Future studies should evaluate EMA strategy use with larger populations of individuals who have formal diagnoses. Another limitation was that all of the participants were female and Caucasian; this may have impacted the dynamics of interactions amongst group members. Future research should include more diversity amongst participants.

Conclusions

This study employed a single subject design to describe findings of an innovative structured group EMA treatment for individuals with mild memory impairments living in the community. Positive treatment effects revealed that individuals with possible mNCD can learn and maintain EMA strategy use following a treatment that taught several EMAs using a group approach as documented by the Roleplay Assessment. These findings emphasize the need to tailor compensatory strategies to meet the participant’s unique needs, residual strengths, and preferences. The current study also provides initial evidence for using roleplay-based measures to document treatment effects. More research is needed to investigate the relationship between roleplay-based measures and everyday performance. It is critical for researchers to continue to develop and investigate person-centered compensatory interventions aimed to enhance the cognitive communication skills of individuals with mNCD.
References


Roberts, R. O., Geda, Y. E., Knopman, D. S., Cha, R. H., Pankratz, V. S., Boeve, B. F., ...


CHAPTER FIVE: THE DEVELOPMENT AND INITIAL VALIDATION OF THE FUNCTIONAL EXTERNAL MEMORY AID TOOL

Introduction

Although the number of Americans who experience mild cognitive impairment (MCI) is rising above 11.6 million (Alzheimer’s Association, 2018), professionals struggle to consistently assess cognitive deficits and identify functional performance to provide effective treatments for this population (Petersen et al., 2010). In addition, approximately 32-38% of individuals with MCI will progress to a major form of dementia within five years (Mitchell & Shiri-Feshki, 2009; Ward, Tardiff, Dye, & Arrighi, 2013). Thus this prevalence, emphasizes the need to assess early to ensure meaningful interventions take place (Petersen et al., 2010). Currently, no pharmacological or impairment-based interventions reduce the rate of cognitive decline for individuals with progressive impairments (Petersen, 2016). Therefore, lifestyle modifications (e.g., compensatory strategies) and behavioral interventions are needed to maintain independence. In fact, according to the DSM-V (American Psychiatric Association, 2013), individuals with mild neurocognitive disorder continue to manage complex activities of daily living independently but require compensatory strategies to help maintain independence during everyday tasks. Therefore, professionals need appropriate assessment tools to examine the everyday needs/skills and use of compensatory strategies to facilitate independent living into the future for individuals with mild neurocognitive disorder (Blazer, 2013).

One common compensatory strategy that successfully facilitates increased functional performance of everyday tasks is the use of external memory aids (EMAs; Sohlberg et al., 2007).
EMAs reduce the cognitive burden by placing the emphasis on one’s preserved strengths to retrieve necessary information needed to complete daily tasks (Lanzi, Burshnic, & Bourgeois, 2017). Although there is strong evidence for interventions incorporating EMAs, individuals rarely sustain these strategies following intervention (Scherer, 2005). Poor maintenance may be due to the lack of tools available for professionals to assess cognitive strengths and functional performance to develop person-centered interventions that facilitate improved performance (Brown, 2018; Hickey & Bourgeois, 2018).

**Cognitive Impairment-Based Assessments**

The majority of assessment tools used by speech-language pathologists to develop interventions for individuals with mild neurocognitive disorder are impairment-based (Brown, 2018). Standardized screening tools and assessments examining cognitive impairments may help to establish a diagnosis (or prognosis); however, they were not designed to inform compensatory treatment planning (Hickey & Bourgeois, 2018). Unfortunately, professionals continue to rely on administration of impairment-based tools to develop interventions although researchers and clinicians have acknowledged the problematic nature of these assessments, including their lack of ecological validity, sensitivity, and specificity (Turkstra et al., 2005; Ylviasker, Szekeres, & Feeney 1998; Ylviasker et al., 2001). Exploring these types of tools in further detail may help us understand where modifications are needed to provide the desired information about compensatory strategies.

**Cognitive screening tools.** The *Mini-Mental State Exam* (MMSE; Folstein, Folstein, & McHugh, 1975) and the *Montreal Cognitive Assessment* (MoCA; Nasreddine et al., 2005) are two of the best-known cognitive screening scales. These tools are widely used by a variety of rehabilitation professionals due to their brevity and ability to describe clients' cognitive global
functioning (Hickey & Bourgeois, 2018).

Folstein et al. (1975) developed the MMSE to help estimate severity of the cognitive impairment and document changes in cognition. The screening tool takes approximately five to ten minutes to administer and the items examine several domains of cognitive function: visuospatial, language, concentration, memory recall, and orientation (totaling 30 points). During the MMSE administration, participants complete decontextualized objective tasks (e.g., naming of three objects and copying intersecting pentagons). Professionals across various disciplines use the criterion scores to determine the severity levels of cognitive impairment. Although criterion scores are easy to interpret, the scores are greatly influenced by education, age, and culture and therefore are not sensitive to detect milder cognitive deficits (Tombaugh & McIntyre, 1992). In addition, the MMSE does not examine executive functioning skills necessary to complete daily tasks. This is a major limitation as the use of compensatory strategies is dependent on such skills.

Therefore, Nasreddine et al. (2005) designed the MoCA, a brief cognitive screening tool to better detect mild impairments (Larner, 2012). The screening tool’s administration time is approximately 10-15 minutes and the maximum total score is 30 points. Similar to the MMSE, the MoCA screens a variety of language and cognitive processes (i.e., visuospatial, executive functions, language, attention/concentration/working memory, memory recall, and orientation) with decontextualized tasks. Although the MoCA is sensitive to mild impairments, screening tools provide insufficient information to draw conclusions about the nature of cognitive impairments or the use of compensatory strategies. Therefore, comprehensive dementia assessment batteries are often recommended (Moafmashhadi & Koski, 2013).

**Comprehensive dementia assessment batteries.** Several batteries of cognition exist that comprehensively assess a client at the impairment level. These assessment batteries examine
extensively a broad range of cognitive and language domains; however, the specific cognitive assessments included are decontextualized making it difficult for individuals to understand and complete the tasks (Mungas, Reed, & Kramer, 2003).

One frequently used comprehensive assessment battery is the *Repeatable Battery for the Assessment of Neuropsychological Status* (RBANS; Randolph, Tierney, Mohr, & Chase, 1998). The RBANS includes 12 subtests yielding six indices (e.g., memory and attention). Administration of the RBANS takes approximately 30 minutes and was designed to identify abnormal cognitive decline in older adults. Unfortunately, the tasks within the RBANS are decontextualized and provide limited information on the executive functioning or functional performance of individuals with neurocognitive disease.

Bayles and Tomoeda (1993) developed a comprehensive assessment battery: the *Arizona Battery of Communication in Dementia* (ABCD). Within the ABCD are four screening tasks and 14 subtests to assess several cognitive-linguistic domains. Although the ABCD is normed with a large population of individuals, the battery is time consuming, lengthy and not reflective of functional behavior. Therefore, clinicians rarely administer the ABCD in its entirety (Hickey & Bourgeois, 2018). To enhance clinical utility, the researchers developed the *Functional Linguistic Communication Inventory* (FLCI; Bayles & Tomoeda, 1994) to measure the functional communication of individuals with moderate and severe forms of dementia. Although the researchers developed the FLCI to be “functional,” there is little evidence supporting the ecological validity of the tool. Clinicians also describe the FLCI’s limited use of contextual supports and cues a disadvantage and not reflective of the interventions typically used with this population (Johnson & Jackson, 2008).

Each of the cognitive measures described above have two major shortcomings: (1) they are
not representative of functional performance, and (2) they do not facilitate the development of compensatory interventions (Hickey & Bourgeois, 2018). Thus, focusing on impairments during assessment is not an effective approach for individuals with neurocognitive disorder (Holland, 2003). Rather professionals need to use assessment approaches that measure functional cognitive skills (e.g., executive functioning), social contexts, and activity participation to guide the development of person-centered interventions. For example, instead of measuring the accuracy of naming objects or drawing figures, professionals need measures that examine an individual’s ability to participate in planning for an upcoming doctor's appointment or shopping trip (Eadie et al., 2006). Thus, researchers suggest the need for speech-language pathologists to consider the several domains of the World Health Organization’s (WHO) International Classification of Functioning, Disability, and Health framework and, in particular, examine the domain of Participation, Environment, and Activity in assessment and interventions of individuals with mild neurocognitive disorder (Eadie et al., 2006; Hickey & Bourgeois, 2018; WHO, 2001).

Activities of Daily Living Assessments

Individuals with mild neurocognitive disorder, and normally aging adults, may use compensatory strategies to enhance their activity participation (American Psychiatric Association, 2013). Therefore, professionals need to assess one’s ability to complete activities of daily living, noticing whether or not the individual uses a compensatory strategy successfully. Although a variety of assessments exist that examine activities of daily living, these measures have several limitations, including the omission of compensatory strategy assessment.

Informant-Based measures. Researchers developed questionnaire scales to examine individuals with neurocognitive disorders’ ability to complete activities of daily living (Ramsay, Winget, & Higginson, 1995). Unfortunately, several of these questionnaires (for example the
Functional Assessment Staging scale; Reisberg, 1988) are designed to stage individuals with neurocognitive disease along a continuum of 1 to 7. Such staging questionnaires provide little guidance to rehabilitation professionals designing strengths-based and person-centered compensatory interventions (Bourgeois, Brush, Douglas, Khayum, & Rogalski, 2016).

In addition, these questionnaires were designed to be completed by a caregiver (e.g., nurse, family member, or resident assistant). Therefore, the information obtained by questionnaires includes judgments and biases that may impact the results of the assessment (Bucks, Ashworth, Wilcock, & Siegfried, 1996). The Disability Assessment in Dementia Scale (DADS; Gélinas, Gauthier, McIntyre, & Gauthier, 1999) is another questionnaire or interview to be completed with a caregiver to examine clients’ initiation and performance of daily activities. The 46 items on the DADS are categorized into three domains: (1) initiation, (2) planning and organization, and (3) performance. Since the DADS was developed for use in clinical trial research, the clinical utility of the tool is often questioned (Hickey & Bourgeois, 2018). The interview-based administration may be too lengthy for a busy clinical setting and the questions do not explore communication-based domains. Therefore additional tools, such as the Activities of Daily Living Questionnaire Scale (ADLQ; Johnson, Barion, Rademaker, Rehkemper, & Weintraub, 2004), have been modified to increase applicability to clinical settings. Although researchers have updated and revised these questionnaires, it is vital that professionals do not solely rely on informant-based questionnaires, but rather include the individual with neurocognitive disorder in the assessment process.

Performance-Based measures. Performance-based measures aim to provide professionals with opportunities to include clients in the assessment by examining task execution in simulated everyday activities. Therefore, these types of measures are more ecologically valid than impairment based measures (Hickey & Bourgeois, 2018). The Rivermead Behavioural Memory
Test-III (RMBT-III; Wilson et al., 2008) is a performance-based measure of everyday memory functioning within simulated activities of daily living. For example, clients are asked to recall faces, travel routes, and stories. Although the items are functional, the clients are unable to use contextual supports or compensatory strategies to complete the tasks. For instance, the RMBT-III asks the client to remember to retrieve a personal belonging at the end of the examination. This task is functional because often one has to remember to retrieve a personal belonging; however, in everyday life strategies are commonly used by individuals to complete the described task. One may use environmental cues (e.g., placed the item by the door) or an EMA (e.g., wrote down the words “do not forget umbrella”) to complete the task. Incorporating contextual supports and compensatory strategies into a measure, with items similar to those in the RMBT-III, may better assist professionals designing person-centered therapeutic plans that teach compensatory strategies that sustain following intervention.

Similar to the RMBT-III, the Communication Activities of Daily Living-3 (CADL-3; Holland, Fromm, & Wozniak, 2017) is a performance-based measure for individuals with neurogenic communication disorders. The items in the CADL-3 are simulated activities; however, the items primarily focus on language-based daily activities (e.g., telephone use). Another commonly used measure is the Texas Functional Living Scale (TFLS; Cullum et al., 2001), which focuses on instrumental activities of daily living. This test was designed to have high clinical utility and to be appropriate for individuals with varying levels of Alzheimer’s type dementia because the items are highly functional and examine participant behavior. Unfortunately, the TFLS (like the RMBT-III and CADL-3) does not incorporate strategies that may improve functional performance for individuals with mild memory impairments. Thus, when assessing for treatment planning, assessments need to be reflective of everyday tasks and
explore clients’ cognitive communication strengths through compensatory strategies (Hickey & Bourgeois, 2018).

**Compensatory Strategies**

As individuals progress from mild to major forms of neurocognitive disease, neuropathways that once supported cognitive-communication skills begin to deteriorate (Hickey & Bourgeois, 2018). Therefore, compensatory strategies are useful because they reduce the burden of impaired processes by providing alternative routes to retrieve stored information to enhance independent function longer than otherwise possible (Lanzi, Burshnic, & Bourgeois, 2017). Researchers have investigated several types of compensatory strategies to support individuals across the continuum of the disease, such as, spaced retrieval (Camp & Schaller, 1989), memory wallets (Bourgeois, 1992; 2014), written cues (Bourgeois, Burgio, Schulz, Beach, & Palmer, 1997), visual cues (Davis & Weisbeck, 2016), and external and internal memory aids (Stott & Spector, 2011).

External memory aids (EMAs), as described earlier, are an evidence-based cognitive communication treatment approach that capitalizes on the intact skills or strengths of the individual (Lanzi et al., 2017). Interventions incorporating EMAs enhance the quality of life and independence of individuals with neurocognitive disorder (Hopper et al., 2013). Therefore, researchers recommend teaching EMAs early during the course of the disease (Lanzi et al., 2017; Lanzi, Wallace, & Bourgeois, 2018). Although researchers have investigated EMA instruction programs, limited evidence exists to assist professionals in evaluating clients' strategy use prior to intervention. The lack of measures to examine EMA use could be the reason for limited sustained strategy use following intervention (Scherer, 2005).
**Self-Report strategy measures.** Currently available measures to examine compensatory strategy use are primarily informant-based or self-report tools. One commonly used questionnaire is the *Multifactorial Memory Questionnaire* (MMQ; Troyer & Rich, 2002). The MMQ is a self-report questionnaire used to assess self-perception of everyday memory functioning. The MMQ has three factors: Contentment, Ability, and Strategy. Within each factor are several items (i.e., Contentment=18 items, Ability=20 items, and Strategy=19 items) to which the respondent rates the items using a five-point scale (strongly agree, agree, undecided, disagree, and strongly disagree) to indicate the level of agreement. The psychometric properties conducted on this tool are limited. However, due to the few tools available, the MMQ is often used in research and clinical practice.

Kinsella et al. (2014), for example, conducted a well-designed randomized controlled single blind trial and evaluated the effects of a five-week group intervention training a variety of compensatory strategies. The researchers utilized prospective memory tasks, adapted from the RMBT-III, to examine functional performance of cognitive skills and the MMQ to examine self-perceived memory skills. The researchers reported a significant medium-size group effect on the prospective memory tasks during follow-up assessments at two weeks and four months. However, the group effect on self-reported memory ability on the MMQ was not significant during either follow-up assessment. The researchers suggest the discrepancies in findings between the self-report tool and prospective memory tasks may be due to the limitations of self-report questionnaires (e.g., participant subjective memory beliefs). Thus, relying solely on client self-report to evaluate strategy use and plan compensatory interventions is insufficient.
Simulated External Memory Aid Assessment

Currently available assessment measures may provide rehabilitation professionals with information regarding a specific domain (e.g., cognition or activities of daily living), but each fails to integrate a strengths-based approach to assessment indicative of real-world activity and performance that is inclusive of everyday strategies to enhance performance of such tasks. Therefore, measures that examine functional performance and strengths are necessary to tailoring treatment plans to individual needs (Hickey & Bourgeois, 2018). One approach to addressing the gaps in the previously described standardized and subjective measures is to simulate real world experiences and examine the individual’s responses (both strengths and weaknesses with or without EMAs) to challenging scenarios typical of daily living.

Lanzi et al. (2018b), for example, developed a simulated assessment task to investigate the effects of a six-week group intervention, training individuals with mild neurocognitive disorder to use several EMAs. In addition to self-report and impairment-based tools, the study incorporated a researcher-designed roleplay activity examining individual compensatory strategy use within an everyday task (i.e., retrieving information from a pre-recorded voicemail about an upcoming event). Prior to playing the voicemail, the examiner told participants they could use any strategy on the table (e.g., paper, timer, calendar) to assist them to retrieve information following the recording. Participants in the intervention group increased the amount of accurate information retrieved and strategy use following intervention, as compared to the control group. This study provided initial evidence for a simulated performance-based functional measure that incorporated strategy use; however, a single roleplay task was investigated and only group changes were explored.
Lanzi and Bourgeois (2018) employed a multiple baseline design across dyads to examine the individual effects of a three-week intervention training several EMAs. The researchers expanded the roleplay activity to include three everyday tasks. During the tasks, the participants were asked to (1) remind the examiner of a specific topic within a stated time interval (e.g., 2 minutes), (2) retrieve information from a voicemail about an upcoming event, and (3) retrieve information from their calendar about three upcoming events. Throughout each task the participants had opportunities to use EMAs (e.g., paper, timer, calendar). The participants increased performance on the expanded roleplay assessment following intervention. However, each participant performed uniquely, emphasizing the need to develop personalized interventions to facilitate sustained strategy use. This finding is similar to previously conducted research on individuals' EMA preferences that described the unique preferences of individuals of similar lifestyles and emphasized the need to obtain this information prior to selecting EMAs (Lanzi et al., 2018a).

To enhance the everyday cognitive communication needs of individuals with mild neurocognitive disorder role-play assessment tools must be expanded to simulate various everyday tasks for individuals with mild neurocognitive disorder. Similar to items in the RBANS-III, CADL-3, and the TFLS, the proposed tool aims to simulate everyday tasks, but incorporates levels of assistance through EMAs. To date, no other measure has examined EMA use within simulated everyday tasks and measured the psychometric properties for individuals with mild neurocognitive disorder. In fact, the majority of performance-based tools do not provide data on validity and reliability for individuals with mild cognitive impairment (Belchior et al., 2015). Without the proposed assessment, professionals will use inadequate tools to design compensatory-based interventions without long lasting effects. Thus, the present study aims to
develop and evaluate the *Functional External Memory Aid Tool* in order to bridge the gap between current assessment tools and interventions for individuals with mild neurocognitive disorder.

**Research Aims**

Phase 1

1. To develop the item pool for the *Functional External Memory Aid Tool*

2. To evaluate the content validity of the measure

Phase 2

3. To evaluate the internal structure (dimensionality) of the measure

4. To examine the relationship between the *Functional External Memory Aid Tool* and participant demographic variables (i.e., age and education), the MoCA, and MMQ.

**Phase 1-Development And Content Validity Of The FEMAT**

**Operational Definition**

The *Functional External Memory Aid Tool* (FEMAT) item pool was developed using guidelines presented by Crocker and Algina (2006). The steps outlined below are necessary to establish content-oriented evidence for the instrument (Lambie, Blount, & Mullen, 2017). First, an operational definition of the construct of *Everyday Strategy Use*: examining one’s ability to use EMAs to compensate for impairments in cognition to enhance the completion of everyday tasks, was established. This definition was based on a literature review of similar assessments (as described above). In addition to using the strengths and limitations of the reviewed instruments, the construct definition is consistent with the WHO's International Classification of Functioning, Disability, and Health framework for assessing cognition in social contexts (WHO, 2001). Specifically, the use of strategies examines the domain of Environmental factors and everyday
tasks are within the domain of Participation. Thus information obtained from the FEMAT is intended to examine the influence of Environmental factors and Participation on an individual's Activity performance.

**Item Generation for the FEMAT**

Next, the initial item pool was generated from five sources: (a) examination of existing instruments that assess activities of daily living and strategy use; (b) review of the mild neurocognitive disorder intervention literature focused on compensatory strategies; (c) pilot studies of simulated functional role play assessment tools (Lanzi et al., 2018b; Lanzi & Bourgeois, 2018); (d) discussion with experts in the field and individuals with mild neurocognitive disorder; and (e) evaluation of FEMAT content by cognitive communication experts.

The RMBT-III, CADL-3, TFLS, and MMQ were reviewed to identify possible items that could be revised to examine one's use of EMAs to complete everyday tasks. Throughout pre-testing, items were reworded to increase clarity and simplicity. Kline's (2005) nine rules for guiding the development of appropriately written items were considered. Following the initial review of previous research and similar measures, the initial item pool of the FEMAT consisted of 15 items and a five-point scoring rubric.

An expert panel reviewed the items to assess item verification. The panel consisted of six individuals who are content domain experts: (1) an international dementia researcher; (2) a speech-language pathologist specializing in cognitive communication; (3) a clinical-instructor in dementia practice for speech-language pathologist; (4) a clinical researcher and certified educator for Montessori for Aging and Dementia; (5) a neuropsychologist and test development researcher; and (6) a cognitive communication test development researcher. The reviewers used
electronic forms with detailed instructions for recording their evaluations on various aspects of the FEMAT using a 4-point scale (with anchors of 1-\textit{not acceptable [major modifications needed]} to 5-\textit{exceeds expectations [no modifications needed]}) and for narrative feedback/suggestions. The reviewers rated the following aspects for each item of the FEMAT: representativeness, clarity of wording, importance in measure the construct, word structure, and scoring rubric structure. Following independent completion of the review forms, a summary table of the mean ratings across the six reviewers (refer to Table 5.1) was created. In addition, the narrative feedback and suggestions from each reviewer were summarized into a statement of the major concerns for each item (refer to Table 5.1). Then the summary table and statements were reviewed and each item was revised based on the concerns. Lastly, the FEMAT’s scoring rubric was revised based on feedback from the expert panel and a developer of the CADL-3.
Table 5.1. Mean Scores from Expert Reviewers, Summary Statements of Narrative Feedback, and Researcher's Response to Feedback.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Representativeness</th>
<th>Clarity</th>
<th>Importance</th>
<th>Word Structure</th>
<th>Scoring Structure</th>
<th>Summary of Feedback</th>
<th>Response to Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>4.40</td>
<td>3.60</td>
<td>3.40</td>
<td>3.80</td>
<td>4.20</td>
<td>-Necessity of item to construct</td>
<td>-Item removed</td>
</tr>
<tr>
<td>Item 2</td>
<td>4.60</td>
<td>3.75</td>
<td>4.60</td>
<td>4.25</td>
<td>3.80</td>
<td>-Use of the following terms: me vs. you, initiated vs. set, verbally vs. initiated</td>
<td>-Overall scoring revised</td>
</tr>
<tr>
<td>Item 3</td>
<td>4.80</td>
<td>4.80</td>
<td>4.80</td>
<td>4.75</td>
<td>4.40</td>
<td>-Scoring clarifications, concern with 2-part item</td>
<td>-Removed 2-part item</td>
</tr>
<tr>
<td>Item 4</td>
<td>4.40</td>
<td>4.60</td>
<td>4.40</td>
<td>4.50</td>
<td>4.00</td>
<td>-Measuring accuracy different than measuring strategy use</td>
<td>-Added form to complete task</td>
</tr>
<tr>
<td>Item 5</td>
<td>4.25</td>
<td>4.00</td>
<td>4.25</td>
<td>4.50</td>
<td>3.50</td>
<td>-Overall complexity of the task</td>
<td>-Item removed</td>
</tr>
<tr>
<td>Item 6</td>
<td>4.80</td>
<td>4.80</td>
<td>4.80</td>
<td>4.75</td>
<td>3.80</td>
<td>-Use of the following term: show me</td>
<td>-Added “show me”</td>
</tr>
<tr>
<td>Item 7</td>
<td>4.60</td>
<td>4.20</td>
<td>4.60</td>
<td>5.00</td>
<td>4.60</td>
<td>-Complexity of task components</td>
<td>-Added prompt</td>
</tr>
<tr>
<td>Item 8</td>
<td>4.40</td>
<td>4.80</td>
<td>4.75</td>
<td>4.75</td>
<td>4.25</td>
<td>-Retrieval of components</td>
<td>-Added form to complete task</td>
</tr>
<tr>
<td>Item 9</td>
<td>4.80</td>
<td>4.40</td>
<td>4.80</td>
<td>4.75</td>
<td>4.20</td>
<td>-Complexity of item materials</td>
<td>-Reduced complexity of bill content</td>
</tr>
<tr>
<td>Item 10</td>
<td>4.60</td>
<td>4.50</td>
<td>4.60</td>
<td>4.50</td>
<td>3.00</td>
<td>-More of an observation task</td>
<td>-Item removed</td>
</tr>
<tr>
<td>Item 11</td>
<td>4.20</td>
<td>4.80</td>
<td>4.40</td>
<td>4.75</td>
<td>3.20</td>
<td>-Not reflective of daily task</td>
<td>-Item removed</td>
</tr>
<tr>
<td>Item 12</td>
<td>4.80</td>
<td>4.40</td>
<td>4.60</td>
<td>4.75</td>
<td>4.20</td>
<td>-Concerns with item wording</td>
<td>-Reworded item</td>
</tr>
<tr>
<td>Item 13</td>
<td>4.40</td>
<td>4.60</td>
<td>4.80</td>
<td>4.50</td>
<td>4.20</td>
<td>-Concerns regarding use of pharmacy phone number</td>
<td>-Revised to email about prescription order</td>
</tr>
<tr>
<td>Item 14</td>
<td>4.20</td>
<td>4.20</td>
<td>4.60</td>
<td>3.75</td>
<td>3.40</td>
<td>-Difference between appointment and shopping message</td>
<td>-Item restructured</td>
</tr>
<tr>
<td>Item 15</td>
<td>4.00</td>
<td>4.60</td>
<td>4.00</td>
<td>4.75</td>
<td>3.80</td>
<td>-Discussion on type of EMA use</td>
<td>-Item removed</td>
</tr>
</tbody>
</table>
Results

The process of test development and item refinement resulted in 11 items (reduced from 15) designed to explore the overarching construct of *Everyday Strategy Use*, as shown in Appendix E. The 11-items were distributed among three factors: Factor 1-Medical Tasks (e.g., sorting medications; 3-items); Factor 2-Instrumental Daily Tasks (e.g., remembering details of a birthday invitation; 4-items); and Factor 3-Retrieval-Based Tasks (e.g., reminding examiner to complete an upcoming task; 4-items). Each item was developed to simulate everyday tasks within each specific factor domain. For each item, the participants were asked to "show" the researcher how he/she would complete the task or retrieve specific information for the task. In addition, the scoring rubric was revised from a 5-point interval scale to a 4-point categorical scale. Refer to Appendix E, for the FEMAT’s complete 11-item pool with the 4-point categorical scoring rubric.

Phase 2-Establish Initial Psychometric Properties Of The FEMAT

Participants

Participants were recruited from several metropolitan areas of Tampa, FL, Pittsburgh, PA, and Providence, RI, and consisted of a community-based sample of individuals with possible mild neurocognitive disorder. In each city, fliers were posted and property managers from local senior centers and independent senior or retirement living complexes were contacted. Property managers of two senior centers and seven retirement living communities invited the researcher to give a presentation discussing the study to the older adults in the community. Prior to the presentation, fliers were posted in each community site aimed to recruit older adults who met the following inclusion criteria: 60 years or older; self-report of cognitive status change within the last 6 months to one year; community dwelling; self-report of independence completing activities
of daily living; premorbid literacy with English as first language; negative self-reported history
of delirium, stroke, or other acquired neurological condition; and no self-reported formal
diagnosis of dementia. As shown in Table 5.2, recruitment was divided into three phases.

During Phase 1 of recruitment, older adults independently attended the study recruitment
presentation that lasted approximately 30 minutes. In addition to the presentation, the researcher
spoke with interested older adults at each site location throughout the day regarding the study. If
interested, the older adults scheduled a time to meet with the researcher to complete Phase 2 of
recruitment.

Following informed consent, the researcher used a demographic form to guide a semi-
structured interview with the participant to obtain demographic and basic study eligibility
information. Then, the remaining screening measures were administered: (15-item Geriatric
Depression Scale (GDS; Sheikh & Yesavage, 1986), MoCA, and Functional Vision, Hearing, and
Communication Screening Measure (FunctVHC; Bourgeois, Dijkstra, Burgio, & Allen-Burge,
2001)). To progress to Phase 3 of recruitment the participant needed to meet the following
criteria: a score on the MoCA within the range of MCI (21 to 25) (Nassreddine et al., 2005); a
score less than or equal to 5 of self-reported depressive symptoms on the GDS; and a passing
score on the FunctVHC. If the participant met study criteria, then the individual was included as
a participant in the research study. Screening procedures were conducted individually in a quiet
room at the site location from which the participant was recruited. If the individual consented,
sessions were video-recorded and lasted approximately 30 minutes.

Ninety-nine participants (9 participants per item) were included in the present analyses.
The participants varied in age, sex, race, and level of education. However, majority of the
participants (87%) were Caucasian women. Of the 99 participants, six were men, five were
African American, and one was Hispanic. The mean age of the participants was 80 (median=80; range=64-94). The average level of education for the participants was 14 years (range=11-22 years). Their mean MoCA score was 23 (median=22; range=21-25).

Table 5.2. Number of Participants Recruited at Each Site Location.

<table>
<thead>
<tr>
<th>Site Location</th>
<th>Total Number of Residents/Seniors</th>
<th>Phase 1 Recruitment</th>
<th>Phase 2 Recruitment</th>
<th>Phase 3 Recruitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.C (SC)</td>
<td>90</td>
<td>14</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>S.C (SC)</td>
<td>87</td>
<td>25</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>S.H (RLC)</td>
<td>106</td>
<td>50</td>
<td>32</td>
<td>23</td>
</tr>
<tr>
<td>R.S (RLC)</td>
<td>94</td>
<td>23</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>S.S (RLC)</td>
<td>69</td>
<td>12</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>P.I (RLC)</td>
<td>68</td>
<td>27</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>M.N (RLC)</td>
<td>59</td>
<td>11</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>U.V (RLC)</td>
<td>275</td>
<td>50</td>
<td>40</td>
<td>28</td>
</tr>
<tr>
<td>R.I (RLC)</td>
<td>102</td>
<td>8</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Note. Each site location was given a pseudo abbreviation; (SC)=Senior Center; (RLC)=Retirement Living Community; Phase 1=Number of adults who attended the recruitment presentation or talked with the researcher; Phase 2=Number of adults who participated in screening procedures; Phase 3=Number of adults included in the study.

Study Procedures

Immediately following screening procedures, the MMQ and FEMAT were administered in randomized order. During the administration of the MMQ, the participants were instructed to read the written directions and independently rate (with a written marking) each of the 57 items using a scale from strongly agree to strongly disagree or from all the time to never depending on the subtest (i.e., MMQ-Contentment, MMQ-Ability, and MMQ-Strategy). Administration of the MMQ was approximately 20 minutes.

The 11-item FEMAT (refer to Appendix E) was administered individually to each participant. First, the researcher placed several EMAs on the table in front of the participant (i.e., calendar, notepad, sticky note, timer, pill organizer, and pen). Then, the participant was told that he/she could use any of the EMAs on the table to help them complete the everyday tasks within
the assessment. The researcher pointed to and identified each item on the table. The participant was also told that he/she could use anything with him/her (e.g., phone) to help complete the tasks. Then the 11-item pool of the FEMAT was administered and each item was scored using a 4-point scale. The items were orally read to the participant and he/she could respond in a variety of ways (e.g., written, oral, or gestural). The administration of the FEMAT was approximately 10-15 minutes.

**Reliability and Fidelity**

To examine reliability of the FEMAT, raters were trained to record data while watching the session video recordings of the FEMAT administration. During training procedures, the raters were taught how to score each item using the 4-point scale while watching a sample video. Then, the raters had to each complete the scoring for a FEMAT administration session and score to a rate of 80% agreement with the researcher prior to independently scoring 20% of the sessions. The raters used a spreadsheet to score each item. After independent ratings, inter-rater reliability was conducted by dividing the total number of both raters’ FEMAT scores in agreement by the total number of raters’ agreement and disagreements; 91% (range=81-100%) point-to-point agreement was obtained. To examine researcher fidelity, raters were trained to administer the FEMAT. During training procedures, the raters had to administer the FEMAT and score 100% accuracy. Following training, fidelity was examined by watching the video recordings of the FEMAT administrations. The raters used a spreadsheet to document if the researcher accurately followed the administration guidelines for each item. Researcher fidelity was conducted by dividing the total number of accurate administrations by the total number of accurate and inaccurate administrations; 100% accuracy was obtained.
Results

Aim 3

Following the development of the instrument and evaluation of initial content validity, the next step was to determine the internal structure of the instrument. Evaluating the internal structure indicates the degree to which the items appropriately conform and represent the defined construct (AERA et al., 2014). One method for determining internal structure is conducting a confirmatory factor analysis. To guide the best practices for confirmatory factor analysis decision-making the researcher conducted the following steps: a) specification of the model, b) estimation of the model parameters, c) evaluation of overall model fit, and d) evaluation of model parameter estimates.

Confirmatory factor analysis. To examine the factor structure the researcher used *Mplus* Version 8 (Muthen & Muthen, 2017) to conduct a three-factor confirmatory factor analysis. The researcher identified the model by setting the first factor loadings to 1.0. The parameter estimates were determined using robust weighted least squares. To evaluate the model fit, the researcher used the following indicators: chi-square likelihood ratio statistic, root mean square error of approximation (RMSEA; Steiger & Lind, 1980), and normed comparative fit index (CFI; Bentler, 1992). Acceptable fit was determined by RMSEA values less than or equal to .08 (MacCullum, Browne, & Sugarwara, 1996) and CFI values greater than .95 (Hu & Bentler, 1999). Multiple fit statistics were used because each has limitations and there is no agreed upon method for evaluation the lack of fit of a model. In addition, the variability between and within site locations on each item was explored by computing intraclass correlations (ICC).
The ICC’s represent the amount of variation between site locations and the degree of clustering or nonindependence of the data within site locations.

A three-factor correlated model using a diagram (refer to Figure 5.1) was specified. The three factors were (1) Medical Tasks; (2) Instrumental Daily Tasks; and, (3) Retrieval-Based Tasks. Factor 1 - Medical Tasks were everyday tasks to manage personal health needs; Factor 2 - Instrumental Daily Tasks were typical everyday cognitive-communication based tasks that examine independent executive functioning skills (e.g., organization); and Factor 3 - Retrieval-Based Tasks were atypical everyday tasks that examine memory skills. As seen in Figure 5.1, each item loads to one of the three factors.

Figure 5.1. Confirmatory factor analysis model.
The model for the FEMAT inconsistently met standards for good fit (refer to Table 5.3). The chi-square value, $\chi^2 (41, N = 99) = 68.50, p<.05$, indicated a significant lack of fit. However, the researcher used alternative measures of fit, less sensitive to sample size, to judge the fit as acceptable. The RMSEA of .08 (MacCullum et al., 1996) and CFI of .95 (Hu & Bentler 1999) are within cutoff values used as a general indicator of acceptable fit.

Table 5.3. Confirmatory Factor Analysis Results for Goodness of Fit.

<table>
<thead>
<tr>
<th>FEMAT</th>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$n$</th>
<th>CFI</th>
<th>RMSEA (90% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-item Scale</td>
<td>68.50*</td>
<td>41</td>
<td>99</td>
<td>.95</td>
<td>.08 (.05-.12)</td>
</tr>
</tbody>
</table>

Note. CFI=comparative fit index; RMSE=root mean square error of approximation; CI=confidence interval. *$p<.001$

Standardized loadings for the FEMAT three-factor correlated model are summarized in Table 5.4. Each of the factor pattern coefficients (loadings) were statistically significantly different from zero ($p<.01$). Standardized factor loadings within Factor 1-Medical Tasks ranged from $0.561$ to $0.929$, Factor 2-Instrumental Daily Tasks ranged from $0.496$ to $0.906$, and Factor 3-Retrieval-Based Tasks ranged from $0.693$ to $0.904$. Across all items, Item 1 had the lowest factor loading ($0.496$) and Item 2 had the highest factor loading ($0.929$).

The correlations amongst the three factors were examined. The correlations are based on latent factors that take into account measurement error. Each correlation was positive and statistically significant ($p<.01$): $r=0.656$ (Factor 1-Medical Tasks and Factor 2-Instrumental Daily Tasks); $r=0.519$ (Factor 2-Instrumental Daily Tasks with Factor 3-Retrieval-Based Tasks); and $r=0.708$ (Factor 1-Medical Tasks with Factor 3-Retrieval-Based Tasks).
Lastly, the ICC for the 11 items (refer to Table 5.4) was examined. ICCs can range from 0 to 1.0, with larger values indicating greater clustering effects within site locations (Dedrick & Greenbaum, 2011). The ICCs ranged from .013 (Item 11) to .250 (Item 1). Both Item 1 and Item 7 were relatively large, which often warrants multilevel analyses (Dedrick & Greenbaum, 2011). However, due to small number of site locations the values should be interpreted with caution.

### Table 5.4. Item Descriptives, Item-To-Total Correlations, Intraclass Coefficients, and Standardized Estimates (Loadings).

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>M(SD)</th>
<th>ICC</th>
<th>I-T r</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1: Medical Tasks</td>
<td>Item 2. Dr. Appointment Voicemail</td>
<td>.72(1.03)</td>
<td>.081</td>
<td>.51</td>
<td>.929*</td>
</tr>
<tr>
<td></td>
<td>Item 3. Dr. Appointment Form</td>
<td>1.39(79)</td>
<td>.019</td>
<td>.49</td>
<td>.683*</td>
</tr>
<tr>
<td></td>
<td>Item 8. Medication Management</td>
<td>1.88(92)</td>
<td>.064</td>
<td>.34</td>
<td>.561*</td>
</tr>
<tr>
<td>Factor 2: Instrumental Daily Tasks</td>
<td>Item 1. Laundry Time</td>
<td>1.30(1.06)</td>
<td>.250</td>
<td>.40</td>
<td>.496*</td>
</tr>
<tr>
<td></td>
<td>Item 4. Party Invitation</td>
<td>1.50(98)</td>
<td>.079</td>
<td>.52</td>
<td>.906*</td>
</tr>
<tr>
<td></td>
<td>Item 7. Bill Management</td>
<td>.83(.82)</td>
<td>.129</td>
<td>.49</td>
<td>.585*</td>
</tr>
<tr>
<td></td>
<td>Item 10. Email Notice</td>
<td>1.22(1.06)</td>
<td>.094</td>
<td>.55</td>
<td>.643*</td>
</tr>
<tr>
<td>Factor 3: Retrieval-Based Tasks</td>
<td>Item 5. Store Request Video</td>
<td>.83(1.09)</td>
<td>.037</td>
<td>.59</td>
<td>.803*</td>
</tr>
<tr>
<td></td>
<td>Item 6. Store Request Form</td>
<td>1.53(84)</td>
<td>.023</td>
<td>.51</td>
<td>.693*</td>
</tr>
<tr>
<td></td>
<td>Item 9. Reminder Task</td>
<td>.81(1.23)</td>
<td>.072</td>
<td>.61</td>
<td>.885*</td>
</tr>
<tr>
<td></td>
<td>Item 11. Retrieval of Reminder Task</td>
<td>1.85(.89)</td>
<td>.013</td>
<td>.65</td>
<td>.904*</td>
</tr>
</tbody>
</table>

Cronbach's alpha
- Factor 1 Cronbach's alpha (CI) | .63 (.48-.74)
- Factor 2 Cronbach's alpha (CI) | .70 (.60-.79)
- Factor 3 Cronbach's alpha (CI) | .78 (.70-.84)
- 11-item scale Cronbach's alpha (CI) | .84 (.78-.88)

*Note. M (SD)=mean (standard deviation); I-T r=item-to-total correlation; CI=confidence interval; ICC=intraclass coefficient. *p<.001

**Internal consistency.** Cronbach’s alpha for each factor and total 11-item scale were examined for internal consistency using SPSS Version 25. As shown in Table 5.4, Cronbach’s alpha for each factor was found to be acceptable (George & Mallery, 2003): Factor 1 (3 items) \( \alpha = .63 \) (.48-.74), inter-item correlation ranged from .269 to .521; Factor 2 (4 items) \( \alpha = .70 \) (.60-.79), inter-item correlation ranged from .315 to .486; and, Factor 3 (4 items) \( \alpha = .78 \) (.70-.84), the inter-item correlation ranged from .333 to .626. The 11-item FEMAT was found to be highly
reliable (11 items: $\alpha = .84(.78-.88)$). The item-to-total correlations for the items within each of the three factors were also examined. All 11-items demonstrated adequate item-to-total correlations (range=.34-.65).

**Aim 4**

The relationship between the FEMAT and additional factors was examined using SPSS Version 25 to conduct correlation analyses to evaluate correlation coefficients. The relationships of the FEMAT score of each factor to the MoCA, MMQ-Contentment, MMQ-Ability, and MMQ-Contentment scores were also examined.

**Demographic variables.** The relationship between specific demographic variables (e.g., age and education level) and the score of each factor of the FEMAT was measured. As shown in Table 5.5, results indicated a direct relationship between the education of participants and the score on each factor of the FEMAT, Factor 1, $r=.333, p<.001$; Factor 2, $r=.114, p>.05$; Factor 3, $r=.329, p<.001$. Results indicated an inverse relationship between the age of participants and the score on each factor of the FEMAT, Factor 1, $r=-.426, p<.001$; Factor 2, $r=-.474, p<.001$; Factor 3, $r=-.254, p<.001$.

**Additional assessment measures.** The relationship between the participants' score on the MoCA and the score on each factor of the FEMAT was also examined: Factor 1, $r=.352, p<.001$; Factor 2, $r=.394, p<.001$; and Factor 3, $r=.250, p=.01$. The correlation analysis for MMQ-Contentment indicated an inverse correlation between the participants' score on MMQ-Contentment and the score on each factor of the FEMAT: Factor 1, $r=-.143, p>.05$; Factor 2, $r=-.188, p>.05$; and Factor 3, $r=-.215, p=.03$. The correlation analysis for MMQ-Ability also indicated a negative relationship between the participants' score on MMQ-Ability and the score...
on each factor of the FEMAT: Factor 1, $r=-.343, p<.001$; Factor 2, $r=-.296, p<.001$; and Factor 3, $r=-.282, p<.001$. Lastly, the MMQ-Strategy correlation analyses revealed a direct relationship between the participants’ score on MMQ-Strategy and the score on each factor of the FEMAT: Factor 1, $r=.262, p<.001$; Factor 2, $r=.165, p>.05$; and Factor 3, $r=.250, p=.01$. Each correlation analysis is reported in Table 5.5.

**Table 5.5. Correlations of Education, Age, MoCA, and MMQ.**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Education</th>
<th>Age</th>
<th>MoCA</th>
<th>MMQ-C</th>
<th>MMQ-A</th>
<th>MMQ-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 Medical Tasks</td>
<td>.333*</td>
<td>-.426*</td>
<td>.352*</td>
<td>-.143</td>
<td>-.343*</td>
<td>.262*</td>
</tr>
<tr>
<td>Factor 2 Instrumental Daily Tasks</td>
<td>.114</td>
<td>-.474*</td>
<td>.394*</td>
<td>-.188</td>
<td>-.296*</td>
<td>.165</td>
</tr>
<tr>
<td>Factor 3 Retrieval-Based Tasks</td>
<td>.329*</td>
<td>-.254*</td>
<td>.250*</td>
<td>-.215*</td>
<td>-.282*</td>
<td>.250*</td>
</tr>
</tbody>
</table>

*Note. MoCA=Montreal Cognitive Assessment; MMQ-C=MMQ-Contentment; MMQ-A= MMQ-Ability; MMQ-S=MMQ-Strategy. Coefficients with * are significant (p<.001).*

**Discussion**

The present study describes the development of the FEMAT intended to meet the clinical need for a validated tool to measure everyday EMA use. The tool provides information about individuals with possible mild neurocognitive disorders’ use of strategies to enhance performance of several types of tasks. The study also provides preliminary evidence for the development and psychometric properties of the FEMAT.

The first aim was to develop the initial item pool for the FEMAT. Similar to other performance-based functional measures, the initial 15-item pool represented everyday tasks typical of older adults. For example, both the TFLS and the FEMAT include items simulating tasks related to bill management, using a calendar, and medication management. However, the items of the FEMAT were designed to improve upon the limitations of the currently available
measures to help clinicians better design compensatory interventions teaching EMAs (Blazer, 2013; Brown, 2018; Hickey & Bourgeois, 2018). To enhance clinical utility the researcher developed a small number of items, included materials realistic of everyday life (e.g., electric bill) and developed a scoring method that reflects actual behavior and level of assistance (i.e., EMA use) needed to complete daily tasks. Unlike other measures, the FEMAT was designed to evaluate EMA use to enhance outcomes of this type of intervention with individuals with mild memory impairments. Therefore, scores on the FEMAT depict one’s use of strategies and everyday task performance.

Next, to explore the second aim the researcher evaluated the content validity of the 15-item pool using an expert panel review. As shown in Table 5.1, the mean rating scores of the reviewers highlight the high level of representativeness and importance of the 15-items in measuring everyday EMA use. The major concerns of the reviewers (as indicated by summary statements) were the lack of a strategy prompt within the items, the inclusion of items that were too complex or not typical daily tasks, and the scoring structure. Thus, the researcher reduced the 15-item pool to 11-items, revised the items to include the prompt “show me,” designed items within three categories of daily tasks, and restructured the scoring to a 4-point categorical scale. To date, no other performance-based measure has used the prompt “show me” and scored the level of EMAs needed to complete daily tasks for individuals with mild neurocognitive disorder. In addition, compared to the TFLS (21-items), RMBT-III (14-subtests), and CADL-III (50-items), the FEMAT has fewer items (11-items). Therefore, the administration of the FEMAT is relatively short (approximately 10-15 minutes). This is a major strength as clinicians often discuss the poor clinical utility of available measures due to their extensive length, thus, relying
on inappropriate measures (e.g., the MoCA) to guide the development of interventions (Brown, 2018; Hickey & Bourgeois, 2018; Turkstra et al., 2005; Ylviasker et al., 2001).

The confirmatory factor analysis (aim 3), confirmed the proposed correlated three-factor model to examine everyday strategy use (refer to Table 5.3 for goodness of fit values). Factor 1-Medical Tasks contained three items and represented tasks related to medical appointments and medication management. Factor 2-Instrumental Daily Tasks contained four items and represented tasks related to typical daily executive functioning skills. Lastly, Factor 3-Retrieval-Based Tasks contained four items and represented tasks that are atypical and examine memory skills. Although the results support three separate factors it is important to note that the correlations between the factors were statistically significant. Therefore, there is a positive relationship between the three factors designed to examine everyday strategy use.

Examination of the standardized estimates, in Table 5.4, indicated that the items loaded appropriately to each factor. Although, each item was statistically different from zero it is important to discuss the items with lower loadings to enhance the overall item-pool. The estimates of Items 1 (Laundry Time), Item 7 (Bill Management), and Item 8 (Medication Management) were below the cutoff value of .60. In addition, both Item 1 and 7 had relatively large ICC values. Therefore, the video recordings of FEMAT administrations were examined to explore the participants’ functional behavior during these items.

During Item 1, the participants were asked to show the researcher how they would remember to check the dryer in 10 minutes. Often the participants discussed being unable to leave their laundry due to theft or building rules, therefore, the older adult would not rely on a timer to complete the task. Rather, the participants would wait and listen for the alarm on the
machine. Thus, future research should examine how to prompt one’s use of a timer using a different simulated task that is not potentially sensitive to site location. Within Item 7, participants were asked to show the researcher how they would pay specific bills on time. After listening to the video recordings, participants often described enrolling in “auto pay” to complete the task. To enhance this item, the researcher should consider redefining the scoring to include a wider array of strategies (e.g., auto-pay or bill organizers). During Item 8, participants were asked to sort medications using a pill organizer. Unlike the other items, the researcher explicitly prompts the participants to use the organizer, which could account for the lower loading. In addition, after listening to the video recordings the researcher was surprised by the vast differences in strategies used by participants to sort medications. Future research, should further explore these descriptions to help refine this item. In addition, researchers could examine trends across the strategies described to help develop appropriate techniques for medication management.

To examine the randomness in the data, Cronbach’s alpha was applied. As indicated in Table 5.4, these analyses revealed reliability scores on Factors 1-3 and the 11-item pool. Thus, at least 63-84% of the total within-test score variance was due to true score variance. Typically, alpha values of .70 or higher indicate acceptable internal consistency (George & Mallery, 2003). Thus, the alpha values for Factor 2, Factor 3, and the 11-item pool were highly reliable. The lower alpha value (.63) of Factor 1 could possibly be due to the small number of items within the factor. In addition, the item-to-total correlations (range=.34 to .65) suggests each item is measuring the construct well and no item should be removed (Nurosis, 1994).
Lastly, to explore aim 4 correlation analyses were conducted and interpreted using guidelines suggested by Cohen (1988). The correlation analyses revealed a weak positive relationship between education and FEMAT factor scores. Cullum et al. (2014) also found a positive relationship between education and the TFLS; however, the relationship was moderate in size. This difference could possibly be due to the high level of education (mean=14 years) of participants in the present study. Unlike previous research (Cullum et al., 2014; Troyer & Rich, 2002), there was an overall negative moderate relationship between age and FEMAT factor scores. Thus, the younger the participants were the more strategies they used. This could possibly be due to the rising use of technology (e.g., smartphone) amongst older adults (Mitzner et al., 2010). In addition, the age of the participants in the present study (range=64-94) was larger than Cullum et al.’s participants’ age span (range=64-85). Future research should control for these demographic factors and recruit participants within specific age groups to further examine the relationship between age and the FEMAT factor scores.

The relationships between the FEMAT factors, MoCA, and MMQ were also examined. Correlation analyses revealed an overall weak positive relationship between the MoCA and the FEMAT. As expected, there was a relationship between the measures (indicating the overlap between cognitive skills and task performance); however, the relationship was weak. These findings emphasize the need to include the FEMAT in clinical assessments to examine one’s strategy use to complete daily tasks because screening measures are not capturing such skills. In addition, the correlation analyses of the MMQ-Contentment and MMQ-Abilities revealed a weak negative relationship to the FEMAT factors. Therefore, the worse someone feels about his or her memory and the more mistakes he or she reports the more strategies they are using to compensate and enhance performance on everyday tasks. Often participants reported that their
memory was not good, but described how they always use strategies. Participants also discussed using strategies to not make the everyday mistakes they reported. Therefore, relying on the MMQ subtest scores in isolation is not reflective of functional behavior. Previous research has also reported a disconnect between an individual’s self-report of contentment and abilities and one's strategy use (Bourgeois, 2013; Kinsella et al., 2001). Thus, in addition to exploring additional ways to examine strategy use, treatments need to focus on improving one's satisfaction with using strategies to compensate for impairments.

Limitations

While the present study provides preliminary evidence to support the development and initial psychometric properties of the FEMAT with individuals with possible mild neurocognitive disorder, several limitations indicate avenues for future research. One issue that should be considered prior to interpreting the results concerns the representativeness of the sample. First, the sample size and demographics of the participants limit the generalizability of the findings. Specifically, the individuals in the study were primarily Caucasian and female. Although women make up approximately two-thirds of patients who have Alzheimer’s disease (Hebert, Weuve, Scherr, & Evans, 2010) and progress at a faster rate from mild to major neurocognitive disorder (Holland, Desikan, Dale, & McEvoy, 2013), future research should aim to include more males to examine the relationship between sex and FEMAT scores.

The researcher examined a community-based sample of individuals who met the DSM-V criteria (American Psychiatric Association, 2013) for mild neurocognitive disorder. Therefore, the participants did not have an official diagnosis of mild neurocognitive disorder. Although the diagnosis of the impairment is often criticized and inconsistent (Petersen, 2016), future research
should consider including individuals with official diagnoses to enhance the generalizability of findings. In addition, future research should examine the FEMAT performance differences across the continuum (mild to major) of the disorder to enhance the psychometric properties for a range of impairments. This could help clinicians to better design interventions for individuals with possible progressive impairments across the course of the disease.

The present study only examined one population of individuals who use EMAs. However, EMAs are also an evidence-based strategy frequently used with individuals with acquired impairments due to stroke or traumatic brain injury (Cicerone et al., 2011; Sohlberg & Mateer, 1989). Those individuals were excluded from the present study; therefore, it is unknown if the FEMAT is appropriate to use with individuals with other acquired neurological impairments. Therefore, future research should explore the use of the FEMAT with these populations.

Similar to other measurement studies in the field of communication disorders (Hula et al., 2015), the present study excluded participants with depression (a score of ≥ 5 on the 15-item GDS). Given the high prevalence of depression among individuals with MCI (Lyketsos et al., 2002), future research should consider including individuals with depression. Furthermore, Modrego & Ferrandez (2004) reported a higher rate of conversion to dementia for individuals who are depressed than those who are not (85% of depressed patients and 32% of non-depressed patients converted to dementia). Therefore, examining the FEMAT’s psychometric properties in the presence of depression is necessary for future research.

Although the present study’s findings offer preliminary evidence for the FEMAT, future research should investigate additional methods of assessing validity and reliability. Based on the
ICC, for example, a future study could increase the number of participants and site locations to better control for possible site location effects on item performance. In addition, researchers could assess construct validity by examining the relationship between performance on the FEMAT and TFLS. To enhance assessment of reliability, future research should examine the stability of item scores over time through test-retest analysis.

Clinical Implications

The FEMAT was designed to address the gaps in currently available measures to help guide clinicians to develop person-centered compensatory-based interventions. The goal of such person-centered intervention is to promote sustained EMA use since the majority of participants do not use the strategies following intervention (Scherer, 2005). Thus, a longitudinal study is needed to examine participants’ sustained strategy use from interventions designed using the FEMAT vs. other performance-based (e.g., TFLS) and impairment-based (e.g., ABCD) measures. Unlike commonly used performance-based and impairment-based measures, following administration of the FEMAT clinicians will have information regarding the patient’s performance of everyday tasks and use of EMAs. This information is critical for treatment planning to help guide person-centered interventions.

For example, Sohlberg and Mateer (1989) developed a three-step approach to teaching EMAs. During this approach, the clinician teaches the client about the features of the aid, then they role-play through scenarios using the aid, and lastly use the aid in one's home environment. Although this approach describes a linear process for teaching EMAs, not all clients may have to start at step one (i.e., acquisition phase). For example, maybe the client already uses a calendar but struggles with how much information to write, or perhaps he/she attempts to use a timer but
has difficulty with accuracy. The individuals in these examples would need assistance to modify their use of strategies to enhance performance. However, often clinicians do not obtain this information until treatment has begun resulting in insufficient use of therapy time. Therefore, the FEMAT was designed to provide clinicians with this type of information during the assessment phase of rehabilitation. Specifically, the FEMAT will provide clinicians with information regarding EMA use during medical, instrumental daily, and retrieval-based tasks. More research, however, is needed to guide clinicians on how to interpret the FEMAT scores and use the information to guide interventions that promote sustained strategy use.

Future research should also examine the clinical utility and validity of the FEMAT. Although the FEMAT was designed to address the gaps in current assessment practices, it is unknown if the FEMAT provides adequate information to guide person-centered interventions. Therefore, future researchers should ask clinicians to report their satisfaction with the information yielded from the FEMAT to develop person-centered interventions.

One surprising discovery from listening to the video recordings of the FEMAT assessment, was the amount of information participants discussed regarding their everyday use of EMAs. For example, during Item 7 the participants would often discuss how they managed their own bills in their home environment or during Item 8 they would describe their medication management strategy as they were sorting the medication in the simulated task. Thus, in addition to serving as a performance-based measure the FEMAT also prompted discussion similar to a patient-centered interview. Future research should examine the content within the video recordings to analyze themes that may emerge regarding individual at-home strategy use.
Conclusions

The present study aimed to develop and investigate the initial psychometric properties of the FEMAT. The results suggest that the FEMAT’s 11-item pool may provide reliable and valid assessment of everyday EMA use in individuals with mild neurocognitive disorder. The FEMAT was designed to be used in clinical settings and potentially to be an improvement over currently available cognitive communication measures because it is based on a strength-based framework to examine functional behavior and level of assistance using EMAs. By being able to examine functional skills and strategy use during assessment, we intend to better design interventions for those with mild memory impairments.

References


Hopper, T., Bourgeois, M., Pimentel, J., Qualls, C. D., Hickey, E., Frymark, T., & Schooling, T.


Lanzi, A., Burshnic, V., & Bourgeois, M. S. (2017). Person-centered memory and


125
CHAPTER SIX: CONCLUSIONS

The present multi-manuscript dissertation aimed to develop and examine external memory aid assessment and treatment approaches for individuals with mild neurocognitive disorder. Current rehabilitation approaches, for the 11.6 million Americans who experience the disorder (Alzheimer's Association, 2018), are not person-centered or designed to enhance and maintain functional behavior. Thus, the everyday cognitive communication needs of individuals with mild neurocognitive disorder are not met and clinicians are using inadequate assessment tools to develop goals without long lasting effects (Blazer, 2013; Scherer, 2005). In addition this disorder is possibly progressive, emphasizing the need for cognitive communication approaches to be proactive and incorporate a strength-based approach (Petersen et al., 2010). The findings from the present dissertation describe innovative person-centered assessment and treatment approaches that incorporate external memory aids to enhance everyday task performance of individuals with mild neurocognitive disorder. Such approaches will facilitate future research on the development of a decision-making framework intended to guide clinicians towards designing individualized treatment plans that promote clients to continue to use strategies to maintain independence. This dissertation represents the initial development of both assessment and intervention tools that clinicians could use that are consistent with this innovative approach to serving their clients with mild neurocognitive disorder.

Simulated assessment approaches that examine external memory aid use, such as the tools described in the current dissertation, were designed to account for the limitations of
commonly used measures. Specifically, currently available tools do not reflect a person's subtle cognitive changes in everyday tasks and do not inform compensatory treatment planning (Hickey & Bourgeois, 2018; Turkstra et al., 2005). Thus, as shown in Figure 6.1, this dissertation described the development of three simulated assessment tools that examine one's use of strategies to complete everyday tasks.

In Chapter 2 the *Role Play Activity* was designed to measure retrieval-accuracy and strategy use during an everyday activity (i.e., voicemail retrieval). This tool was the first to measure task performance and external memory aid use; however, it only explored one type of task. Thus, in Chapter 4 the *Roleplay Assessment* explored additional daily activities (i.e., reminder-task, voicemail task, and calendar adherence). This assessment provided initial evidence for measuring one's strategy use through different types of simulated tasks.

![Figure 6.1. Simulated assessment tools of everyday external memory aid use.](image)

The measures described in Chapters 2 and 4, were used to document treatment effects.
Although using functional outcome measures are important, the findings from Chapter 3 described the necessity of examining personal preferences and everyday performance within the assessment phase of care. Prior to the findings from Chapter 3, it was unclear if individuals with mild neurocognitive disorder had unique external memory aid preferences.

Therefore, in Chapter 5 the Functional External Memory Aid Tool was designed to examine one's use of strategies and preferences prior to developing treatments. The tool simulates everyday activities within three task domains (i.e., Medical Tasks, Instrumental-Tasks, and Retrieval-Based Tasks). In addition, a uniform scoring rubric was developed to examine strategy use and retrieval accuracy. To date, no other measure has examined one's use of memory aids using a functional approach. The initial findings on the psychometric properties of the Functional External Memory Aid Tool represent the innovative design of the functional measure. This innovative person-centered measure restructures current assessment practices and provides initial data to facilitate the use of the Functional External Memory Aid Tool in clinical settings.

Person-centered approaches are necessary in both the assessment and treatment phases of care (Hickey & Bourgeois, 2018). Thus, this dissertation described two person-centered interventions for individuals with mild neurocognitive disorder. The group external memory aid treatment, examined in Chapter 2, evaluated a six-week treatment delivered in a group-format that enhanced the use of high and low-tech memory aids. In addition, the structured external memory aid treatment, examined in Chapter 4, evaluated a four-week treatment delivered in dyads that enhanced individualized use of strategies in everyday tasks. Both studies contributed to the limited literature base exploring cognitive communication treatment for individuals with mild neurocognitive disorder and were the firsts to teach solely external memory aids in a group-
format. Speech-language pathologist can use these treatment approaches to deliver interventions for individuals with mild neurocognitive disorder that promote independence.

Taken together, the results of this dissertation meet the needs of both clients and clinicians by describing a framework of assessment and treatment approaches for individuals with mild neurocognitive disorder. Both the assessment and treatment approaches examined in this dissertation aimed to restructure current practices from impairment-based to activity and person-centered focused. Therefore, clinicians can begin to implement this framework as an advancement over previously used approaches. To further this line of research, the next step is to evaluate a decision-making model to guide the delivery of person-centered interventions teaching external memory aids that promote sustained strategy use. Below is an illustration (refer to Figure 6.2) and description of one possible approach for the decision-making model.

![Figure 6.2. Functional External Memory Aid Tool decision-making framework.](image)

This proposed model is described using the factors of the World Health Organization's
(WHO) International Classification of Functioning, Disability, and Health (WHO, 2001) rarely explored in cognitive assessments: participation, environmental factors, and personal factors. Clinicians must assess each domain to guide the development of interventions that impact functional activity. This model facilitates clinicians to use the Functional External Memory Aid Tool to examine each domain and use the data to develop personalized interventions.

To understand how clinicians can use the proposed model to design interventions, the following text will describe an example. After administering the Functional External Memory Aid Tool the clinician will complete Figure 6.2 by documenting information within each shape. First, the score for each factor will be calculated and written in the factor circles. Since each factor represents a type of daily task, the score provides information about the client's participation. Specifically, the score will indicate if the client described using strategies, attempted to use strategies, or accurately used strategies to participate in everyday tasks. Next, in the squares, the types of external memory aids (e.g., electronic calendar or manual timer) the client described using or used during the assessment will be documented. This information will depict the client's environmental factors that enhance activity performance. In addition, any information that may be unique to the client's environment will also be documented. For example, the apartment complex may not allow residents to leave the dryer unattended; therefore, a timer is unlikely to be used to retrieve the laundry. Next, in the trapezoid, specific details regarding the use of memory aids will be documented to explore personal factors. For example, information about organization of calendar, structure of medication management, and speed of input are important personal factors that influence strategy success and use. Lastly, the information documented on the framework shapes will be analyzed to decide the stage to begin
treatment (i.e., acquisition, application, and adaptation), the types of external memory aids, individual factors to consider, and the types of daily activities to target. Therefore, by using this model the treatment plan will be personalized and designed to meet the client's unique needs.

Using this type of framework will help clinicians to design person-centered interventions that facilitate clients to continue to use external memory aids following treatment. Thus, the findings from the present dissertation will enhance the overall care of individuals with mild neurocognitive disorder and promote the design of treatments that maximize independence.

References


APPENDICES
Appendix A: Role Play Activity Transcript

Voicemail:
"I am calling on behalf of Dr. Matthew's office for your upcoming podiatry appointment on December 21st at two-o-clock. If you need to cancel please call (401)-523-8676. Please bring with you your driver's license and insurance cards to the doctor's appointment. If you could arrive a half an hour in advance so we can go over paperwork that would be best. Thank you and I look forward to seeing you."

Questions:
1. What is the name of the Doctor you have an appointment with?
2. When is the appointment?
3. What type of doctor's appointment is it?
4-5. What do you need to bring to the appointment?
6. When do you need to arrive at the appointment?
7. What number can you call the cancel?
Appendix B: Acquisition Handout 1

**CALENDARS**

*Weekly*  *Electronic*  *Monthly*

**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
## Appendix C: Roleplay Assessment Score Sheet

### Roleplay Assessment Score Sheet

**Date:**

**Session #:**

**Script #:**

<table>
<thead>
<tr>
<th>Task</th>
<th>Question/Prompt</th>
<th>Accuracy</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reminder Task</td>
<td>1. Can you remind me in ______ minutes that I need to give you _______?</td>
<td>Set a Timer: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reminded of Task: /1</td>
<td></td>
</tr>
<tr>
<td>Voicemail Task</td>
<td>2. a) Hi, My name is _______ and I am calling on behalf of Dr. ______ office. b) You have a ________ appointment c) scheduled for _______ at d) _______ o’clock. e) Please bring your _____ and ______ with you to the appointment. f) If you need to reschedule please call (<em><strong>)-</strong>_____-</em>______.</td>
<td>a) Dr’s Name: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Appointment Type: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) Appointment Date: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) Appointment Time: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>e) Items to bring: /2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>f) Phone Number: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used a Strategy: /1</td>
<td></td>
</tr>
<tr>
<td>Calendar Task</td>
<td>3. Would you mind showing me what events you have in your calendar this month?</td>
<td>Brought in Calendar: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Event A: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Event B: /1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Event C: /1</td>
<td></td>
</tr>
</tbody>
</table>

**Participant ID:**

**Total Score:**

_____/14
Appendix D: Acquisition Handout 2

**Calendar Types**

**Weekly**
- Don’t forget
- Clear your head
- Keep you organized
- Schedule for the day
- Don’t overbook yourself
- Establish routine

**Electronic**

**Monthly**

**Why use it?**
- Don’t forget
- Clear your head
- Keep you organized
- Schedule for the day
- Don’t overbook yourself
- Establish routine

**Personalize**
- Color coded
- Symbols
- Abbreviations
- Font size
- Multiple views

**Examples**
- Birthdays, holidays and special occasions
- Appointments
- Payment Schedules
- Medication Schedules
- Your Daily Schedule
FUNCTIONAL EXTERNAL MEMORY AID TOOL

Materials Needed:
- Calendar (monthly and daily)
- Timer (Manual and Portable)
- Notes (notepad, memory wallet, journal)
- Materials Booklet
- Voicemail Recordings
- Voice Recorder
- Pen
- Highlighter
- Medication Organizer
- Pill Bottles

All Materials should be placed on the table within the individual’s reach and sight.

Introduction Directions:

1. Introduce yourself "Hi my name is ________________"

2. "I'm going to ask you to role play through several everyday tasks today. Please feel free to use anything on the table or with you to help you complete the tasks (gestures to the items). There are calendars, timers, medication organizer and notepads. Let's get started. Throughout each task you can refer to anything you have used."

Items

1. "Pretend you just put your clothes into the dryer. Show me how you would remember to check the dryer in 10 minutes?"
   - 0-No response
   - 1-Verbally explained he/she would use a strategy (e.g., set timer)
   - 2-Attempted to set timer or write task information
   - 3-Accurately set timer to 10 minutes

Qualitative Observations/Information:

138
2. "I am going to play a voicemail for you and ask you some questions about the voicemail immediately after it stops. The voicemail is about an upcoming appointment"

☐ 0-No attempt to use a strategy
☐ 1-Attempted to use a strategy (e.g., notepad) during the task
☐ 2-Wrote/typed some of the bold words from voicemail transcript
☐ 3-Accurately wrote/typed all five bold words from the voicemail transcript

Qualitative Observations/Information:

3. "Now I would like you to fill out this form about facts from the voicemail." (Hand the form and pen to the participant)

☐ 0-No accurate facts documented
☐ 1-Accurately documented one-two facts on the form
☐ 2-Accurately documented three-four facts on the form
☐ 3-Accurately documented five facts on the form

Qualitative Observations/Information:

4. "You just received an invitation to an upcoming party (gesture to the paper invitation). Show me how you would remember the information for the party?"

☐ 0-No attempt at task
☐ 1-Verbally explained he/she would use a strategy (e.g., calendar)
☐ 2-Attempted to use a strategy to write some of the invitation information
☐ 3-Accurately documented the key components of the information on a calendar (Key components: correct date, time, location, and type of party)

Qualitative Observations/Information:
5. "A family member just left you a video message asking you to buy something for her next time you are at the store. I am going to ask you some questions about the message after I play the message." (play video)
   □ 0-No attempt to use strategy
   □ 1-Attempted to use a strategy (e.g., notepad) during the task
   □ 2-Wrote/typed some of the bold words from message transcript
   □ 3-Accurately wrote/typed all five bold words from the message transcript

Qualitative Observations/Information:

6. "Now I would like you to fill out this form asking questions about the facts from the voicemail." (Hand the form and pen to the participant)
   □ 0-No accurate facts documented
   □ 1-Accurately documented one-two facts on the form
   □ 2-Accurately documented three-four facts on the form
   □ 3-Accurately documented five facts on the form

Qualitative Observations/Information:

7. "You just received some bills in the mail (gesture to the bills). On each bill is the type of bill, due date, and amount due. Show me how you would remember this information to pay the bills on time."
   □ 0-No attempt at task
   □ 1-Verbally explained he/she would use a strategy (e.g., calendar)
   □ 2-Attempted to use a strategy (e.g., calendar or notepad) to write some of the key bill components
   □ 3-Accurately documented the key components of each bill on a calendar (Key components: correct date, amount due, and type of bill)
8. "These pill bottles contain information about when to take the medications (gesture to pill bottles and pill organizer). Show me how you would use this pill organizer to remember to take these medications."
   - 0-No attempt at task
   - 1-Verbally explained he/she would use a strategy (e.g., calendar)
   - 2-Attempted to use the pill organizer to sort some of the medications
   - 3-Accurately used the pill organizer to place the medications in the correct day/time slot

9. "I am going to set the timer for two minutes for you to remind me to complete a task (set timer for three minutes). I want you to remind me to tell Amanda to call the insurance company before 5:00."
   - 0-No attempt to use a strategy
   - 1-Attempted to use a strategy (e.g., notepad) during the task
   - 2-Wrote/typed some of the bold phrases
   - 3-Accurately wrote/typed all of the bold phrases
10. "You received an email that your prescription will be ready for pickup tomorrow at 3:30 (gesture to email). Show me how you would remember to pick up your medication on time."
   □ 0-No attempt at task
   □ 1-Verbally explained he/she would use a strategy (e.g., calendar)
   □ 2-Attempted to use a strategy to document the information
   □ 3-Accurately documented the correct date, time, and a statement to indicate that the medication will be ready

Qualitative Observations/Information:

11. (Timer goes off). “What did you need to remind me to do?”
   □ 0- No attempt at task
   □ 1-Attempted task with inaccurate information
   □ 2-Attempted task with some of the correct phrases (i.e., “tell Amanda” “call insurance” “before 5:00”)
   □ 3-Accurately stated “tell Amanda” “call insurance” “before 5:00”

Qualitative Observations/Information:
Hi, My name is Sarah and I am calling on behalf of Dr. Matthew's office. You have a cardiac appointment scheduled for November 15th at 4 o’clock. Please bring your medication list with you to the appointment. Also, please arrive 30 minutes in advance to complete the paperwork prior to the appointment. If you need to reschedule please call us. Thank you and we look forward to your visit.
DOCTORS APPOINTMENT

This form is about the information you heard from the voicemail just played. Please complete the form below to the best of your ability.

Doctor's Name: _________________________________________

Appointment Type: _________________________________________

Date of Appointment: _________________________________________

Arrival Time: _________________________________________

Need to bring to appointment:

__________________________________________________________________

–
Invitation

Engagement Party

Friday, February 22 at 6:30 PM

Hosted By: The Arnold's
The Small Galley
11 Winter Rd
Pittsburgh, PA 15223
Video Message Script

“Hi! I hope everything is going well with you. I need you to do me a favor and pick up an outfit for Jacob. He is growing so fast and needs new clothes for our beach trip to Myrtle. He wears size 4t. It would be great if you could pick him out a swimsuit with a shirt. I am going to email you a coupon to the store. We need the clothes by Thursday of next week. Thank you so much.”
MESSAGE QUESTIONS

Please answer the questions below. The questions are about the message you just heard. Please answer the questions to the best of your ability.

1. Who is the outfit for?

_________________________________________

2. What size do you need to buy?

_________________________________________

3-4. What do you need to buy?

_________________________________________

5. When do you need to buy the outfit by?

_________________________________________
Current Month

Previous Balance and Payments
- Previous Balance: 0.00
- Payment Received - N/A: 0.00

Current Monthly Services: 80.00
Other Surcharges, Fees and Adjustments: 21.71
Governmental Taxes, Surcharges and Fees: 10.00

Due Date
August 13th

Amount Due
$111.17

Account Information
Service Address:
15210 AMBERLY DR
APT 1734
TAMPA, FL 33647-2194

Contact
Account Number: 0033881313-03
Online: brighteelec
Customer Support: 1-888-289-8988

Customer Code: 8217
Phone: Dial 611
24 Hour Pay By Phone: 1-866-441-4378

ELECTRIC BILL
Telephone Bill
Monthly Statement

**Bill-At-A-Glance**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous Balance</td>
<td>$189.49CR</td>
</tr>
<tr>
<td>Payment - Thank You!</td>
<td>$38.84CR</td>
</tr>
<tr>
<td>Adjustments</td>
<td>$.00</td>
</tr>
<tr>
<td><strong>Balance</strong></td>
<td><strong>$145.21</strong></td>
</tr>
</tbody>
</table>

**New Charges**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Amount Due</strong></td>
<td><strong>$145.21</strong></td>
</tr>
<tr>
<td>Amount Due in Full by</td>
<td>Jan 3</td>
</tr>
</tbody>
</table>

**Service Summary**

<table>
<thead>
<tr>
<th>Service</th>
<th>Page</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless</td>
<td></td>
<td>$145.21</td>
</tr>
<tr>
<td>512 855-1111</td>
<td>2</td>
<td>$54.83</td>
</tr>
<tr>
<td>512 855-2222</td>
<td>3</td>
<td>$27.03</td>
</tr>
<tr>
<td>512 866-3333</td>
<td>3</td>
<td>$103.35</td>
</tr>
<tr>
<td><strong>Total New Charges</strong></td>
<td></td>
<td><strong>$145.21</strong></td>
</tr>
</tbody>
</table>
Hello,

This is ABCL Pharmacy emailing you regarding your prescription. Your prescription is ready to be picked up tomorrow at 3:30. Please feel free to ask the pharmacist any questions once you have arrived. Thank You
Appendix F: Chapter Two Publication Permission

Assigning the copyright involves us to:

- Effectively manage, publish and make your work available to the academic community and beyond.
- Act as stewards of your work as it appears in the scholarly record.
- Handle misuse requests on your behalf.
- Take action when appropriate where your article has been infringed or plagiarized.
- Increase visibility of your work through third parties.

After assigning copyright, you will retain these rights:

- Be credited as the author of the article.
- Make printed copies of your article to use for a lecture or class that you are teaching on a non-commercial basis.
- Share your article using your free-sp意志 friends, colleagues and influential people you would like to read your work.
- Include your article in your author’s Digital Manuscript (DOA) or Accepted Manuscript (AM), depending on the embargo period in your thesis or dissertation. The Version of Record cannot be used. For more information about manuscript revision and how you can use your work, please see our guide to sharing your work.
- Post your article at a meeting or conference and distribute printed copies of the article on a non-commercial basis.
- Post the AM on a departmental, personal website or institutional repository depending on an embargo period. To find the embargo period for any Taylor & Francis journal, please use the Open Access Options Finder.
Appendix G: Chapter Three Publication Permission
Appendix H: Chapter Four Publication Permission

A. Compliance With Open Access Requirements of Funding Agencies Now and in the Future

ASHA in no way seeks to limit the Authors' ability to comply with the mandates of any funding body or government agency, such as those of NIH, the Wellcome Trust, and others. The requirements and mandates of such bodies vary and are subject to change, so ASHA requires that the Authors abide by the following general stipulations during the course of compliance with such policies:

- Where the funding body indicates an embargo period (i.e., the interval between when the Work is deposited and when the Work is subsequently made publicly available), ASHA requires that the maximum allowable embargo period be specified.

- When allowable by the funding agency, ASHA requires that no version of the Work later than the final, accepted manuscript be deposited for compliance.

- On the deposited Work, a bibliographic record and a link to the Web site of the ASHA journal must be provided so that users can access the final, published version of the Work.

Consult http://journals.asah.org/policies for more specific information about compliance with the requirements of funding agencies and any changes in ASHA policies.

B. Classroom Teaching

The Authors may use the final, published article in classroom teaching and similar academic uses, provided that recipients are made aware that this is copyrighted material not for further dissemination and that the material includes a link to the Web address of the journal in which it was published.

C. Presentation of the Work and Publication in Conference Proceedings

The Authors may present the Work orally in whole or in part and may use elements of the accepted manuscript as needed to support the presentation.

D. Reproduction, Republication, and Dissemination

The Authors may, for professional purposes, make copies of the final, published Work, provided that copyright is attributed and that no commercial use is made of the material. Authors may share by e-mail the PDF file of the final, published Work for the purpose of dissemination to professional colleagues. Authors may also reuse in their own future works, without permission from ASHA, tables and figures from their Work, provided that a full bibliographic citation is provided, including the Web address of the ASHA journal in which the Work was originally published.

Many thanks for your email. You can certainly reuse the article as part of your dissertation. I have attached the copyright declaration you signed and that does allow you fair use to reuse in such a situation.

I have also attached both Appendices as requested.

Let me know if I can assist further.

Regards,

Jason

Jason Roberts, PhD
Senior Partner, Oringe Editorial
310 Main Street
Ottawa
Ontario
K10 1E1
Canada
Tel: 617-417-6269

153
Appendix I: Institutional Review Board Approval Letter

RE: Expedited Approval for Initial Review
IRB#: Pro00037152
Title: Memory Strategy Screening: Restructuring Assessment

Study Approval Period: 10/10/2018 to 10/10/2019

Dear [Name],

On 10/10/2018, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

**Approved Item(s):**

**Protocol Document(s):**
Protocol Version 1.10.3-18

**Consent/Assent Document(s)**:
MSS Consent Version 1.10.3.18.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.
(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,
Appendix J: Approved Informed Consent Form

Study ID: Ame1_Pro00037152 Date Approved: 12/19/2018

Consent to Take Part in this Research Study
And Authorization to Collect, Use and Share Your Health Information for Research

I freely give my consent to take part in this study and authorize that my health information as agreed above, be collected/disclosed in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

__________________________________________  __________________________
Signature of Person Taking Part in Study                  Date

__________________________________________
Printed Name of Person Taking Part in Study

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

__________________________________________  __________________________
Signature of Person obtaining Informed Consent                  Date

__________________________________________
Printed Name of Person Obtaining Informed Consent