

COGNITIVE STIMULATION FOR LONG-TERM CARE
ADULTS WITH DEMENTIA

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COGNITIVE STIMULATION FOR LONG-TERM CARE
ADULTS WITH DEMENTIA

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Dissertation

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ABSTRACT

The purpose of this study was to determine if a strong social environment would enhance the memory abilities of adults with dementia. These adults are residents in a long-term care facility. Pre-test data from the Mini-Mental State Exam (MMSE) and Functional Linguistic Communication Inventory (FLCI) assessments were collected from each participant. Additionally, the participants were assessed in their current ability to provide correct answers to questions taken from a therapeutic program named Memory Magic®. The residents participated in the playing of the Memory Magic activity at the rate of two games per week. A mid-test was given after playing the first 12 games during the first 6 weeks and a post-test was given at the conclusion of the 12-week intervention. One game was played more frequently than the other eight Memory Magic games. During the game playing activities, the residents' behaviors were recorded. At the conclusion of 12 weeks of game playing, the participants were reassessed with the same instruments and questions used for the pre-test, mid-test and post-test. The results for the pre-, mid-, and post-test MMSE scores, FLCI scores, and the scores achieved for game two, were deemed insignificant. The pre to post assessments pertaining to the number of correct answers to the game's questions were found to be significant.

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CHAPTER I
INTRODUCTION

Background

The population of those 65 years old or more has been increasing in the past few years. This is a result of the number of births during the years of 1946 to 1964 also known as the “baby boom” years. The number of births through those 18 years range from a low of 2.36 million in 1940 to a high of 4.3 million in 1957 (see Table 1).

Table 1. Births from selected years 1940 to 1973

| Year | Number of births |
|------|------------------|
| 1940 | 2.36 million |
| 1946 | 3.47 million |
| 1955 | 4.10 million |
| 1957 | 4.30 million |
| 1964 | 4.00 million |
| 1973 | 3.14 million |

Source: Statistical Abstracts of the United States (2010)

Adults over age 65 are not only growing in number due to the birth rate in previous years but also because medical advances have resulted in an increased life expectancy. According to the National Center Health Statistics (2006) the average

life expectancy in the United States for a white male born in 1940 was 62.81 years and 67.29 for white females. The average life expectancy in the United States for a black male born in 1940 was 52.26 years and 55.56 for black females. The average life expectancy for all males born in 1960 was 66.6 years and 73.1 years for all females. The average number of additional years of life for a person who turned 65 in 2004 is 18.7 years (National Center Health Statistics, 2006). This longer physical life is primarily the result of advances in the detection, treatment and prevention of diseases. It is estimated that 5% to 8% of persons ages 65 years to 75 years old will develop dementia (Brynes, 2006). The percentage increases with age such that 15-20% of persons 75 years old, and 25-50% of persons over 85 years old, exhibit symptoms of dementia (Brynes, 2006).

The percentage of dementia from Alzheimer's disease is estimated as 60% to over 90% (American Psychiatric Association, 2013). There are financial costs to society and government when an elderly person with dementia has to receive additional care. Two of these cost areas are Medicaid and Medicare. Medicaid may be accessed when an elderly person has expended all of his or her financial resources. Medicare for the elderly begins at age 65 and is used to pay for medical care and prescriptions.

The increase in life expectancy has augmented the number of persons who receive Medicare and rely upon Medicaid. The elderly adult population (those 65 or older) represented only 7% of those enrolled in Medicaid in 2002 but used 52% of the total Medicaid budget. Thirty-three percent of these elderly used long-term care

services (i.e., nursing homes) and accounted for 86% of all Medicaid spending on the elderly (Sommers, Cohen, & O'Malley, 2006). A study by Martin, Ricci, Kotzan, Lang, and Menzin (2006) revealed an additional annual cost of \$8,200 for long-term care residents with Alzheimer's disease and related dementia compared to residents without dementia.

The combination of the baby boom, a declining birth rate since 1964 and a longer physical life expectancy has cast a spotlight on the elderly population. The increased prevalence of dementia in long-term care is exacerbated by the population increase of the 65 and older with a corresponding increase in the number of long-term care residents. Applied efforts to assist the elderly in maintaining their cognitive abilities may help them maintain their independence. If this is not fruitful, the care of the elderly may become a burden on society and absorb a greater portion of the available governmental resources currently expended to provide the required care in long-term care centers.

President John F. Kennedy, who established the National Council on Aging, said:

This increase in the life span and the number of our senior citizens presents this Nation with increased opportunities: the opportunity to draw upon their skill and sagacity—and the opportunity to provide the respect and recognition they have earned. It is not enough for a great nation merely to have added new years to life—our objective must also be to add new life to those years. (Library of Congress, 1989)

Dementia

Adding new life can be impeded by the fact that as individuals age, their physical and cognitive capabilities are negatively impacted. The age at which this

manifests itself varies among the populace. Factors that can determine when and how this will occur are an individual's genes, diet, physical and mental exercise, occupation, exposure to hazardous materials, life styles, illnesses, injuries and birth defects. There are a myriad of physical ailments that can affect an individual's physical and mental capabilities. For example arthritis can restrict a person's mobility and Alzheimer's disease can devastate the brain. Alzheimer's disease (AD) is one form of dementia and is the most common (Brynes, 2006). Other physical ailments that can affect the mind are vascular disease resulting in strokes, cancerous and benign tumors, Parkinson disease, Lewy Body disease, meningitis, head injuries and hydrocephalus. Dementia can be the result of two or more of the preceding causes such as Dementia with Lewy Bodies (DLB) and Alzheimer's disease (AD). The symptoms are behavioral changes, memory degeneration, compromised motor skills, and dementia can be demonstrated by the loss of the ability to store, recall and analyze information (American Psychiatric Association, 2013).

The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.) (DSM-V), published by the American Psychiatric Association (2013), specified criteria for a diagnosis of dementia includes evidence of memory impairment and the dementia diagnoses includes at least one of the following: aphasia, apraxia, agnosia, and/or impaired executive functioning. Aphasia is an impairment of language, affecting the production or comprehension of speech and the ability to read or write. The loss of the ability to execute complex coordinated movements without muscular or

sensory impairment is a description of apraxia, and agnosia is the loss or diminution of the ability to recognize familiar objects or stimuli (American Psychiatric Association, 2013). Executive functioning refers to the mental capacity to control and apply mental skills (Lang, 2006).

The United States Preventive Services Task Force (USPSTF; 2010) defines dementia as an acquired syndrome of decline in memory and at least one other cognitive domain such as language, visual-spatial, or executive function sufficient to interfere with social or occupational functioning in an alert person.

A person's cognitive abilities such as thinking, storing and recalling information is dependent on a physically healthy brain and also on a psychologically healthy mind referred to as psychosocial. Psychosocial is the interaction between the social environment and a person's psychological behavior. Erikson's (1963) psychosocial development model identified eight stages of development over a life span. Those who have difficulty reconciling positively in any of the stages may have a conflict between their psychological outlook and their social interaction (Merriam, Caffarella, & Baumgartner, 2007). Elderly persons have experienced much in their lifetime. Their psychosocial self has been shaped by events they have created and by those events forced upon them. Beginning at birth, they were dependent on others to care for them and eventually became independent and capable of caring for themselves. They attended school and entered into adulthood, embarked upon a career at home or in industry and may have entered into the military. They may have married and had offspring of their

own. The elderly have experienced death through the loss of their grandparents, parents, siblings, and possibly their own children. The situations they found themselves in affected them positively and negatively.

Now they are in a position of having to be cared for in a long-term care center of which many perceive as though their independence has been taken away from them. At one point in their life, the entire world was open to them. Now, their physical environment has been narrowed to a room in which they live, a room in which they eat, a room in which they attend worship services, and a common area containing other elderly persons. Their psychosocial self has changed dramatically. How well they adapt is partially dependent on the person's previous psychological and sociological well being that was shaped throughout their life. How well they adapt will impact the cognitive brain.

The long-term care physical and social environment will also affect the residents' ability to maintain their cognition. The current nursing home environment is not conducive to maintaining the cognitive abilities of the elderly. Daily activities can include the playing of Bingo, crafts, and attending Mass. Birthday parties occur once a month and occasionally an entertainer will provide music. Some residents may play cards. Nursing homes do provide some physical therapy for residents, mostly to help them maintain their range of motion and to prevent atrophy of unused muscles.

Nursing home residents may develop symptoms of depression. A depressed resident lacks the motivation to use their cognitive skills. Depression, although

often unrecognized in long-term care, is a treatable condition and deserves the attention of the entire medical and nursing staff (Thakur & Blazer, 2008).

Other symptoms of depression are disinterest in their surroundings and activities, loss or gain in weight, sleeplessness, uncooperativeness, insomnia, slowdown of psychomotor responses or excitement, exhaustion, fatigue, loss of energy, sense of guilt, lowered self-esteem, unsociability, loss of attention capacity, lack of inhibition and possibly suicidal thoughts (American Psychiatric Association, 2013). Depression may negatively impact the level of intrinsic motivation for the individual (Amen, 2004). If residents do not have the desire to improve their cognitive abilities and receive self-satisfaction from the process and the rewards of mental exercise, it is unlikely they will benefit from cognitive exercises (Amen, 2004).

A cognitively intact resident can develop mild cognitive impairment (MCI), followed by mild to moderate dementia, and then moderate to severe dementia. Modifying the nursing home environment by increasing the opportunities for education, training, and mental exercises and reducing the tendency to experience depression may help stave off MCI and a journey down the path of dementia. Intellectual stimulation may prevent cognitive decline. Studies have shown computer use, playing games, reading books and other intellectual activities may help preserve function and prevent cognitive decline (Mayo Clinic, 2012).

Statement of the Problem

There are adults in long-term care that are not cognitively able to function on their own due to the onset of dementia. The most prevalent cause of dementia is Alzheimer's disease. There is currently no cure for the disease. The pharmacological approach can slow down the progression of damage to brain cells and the connections between them, but does not prevent the continuation of destruction.

This study will help determine if an intervention applied in a social setting has a positive learning effect for persons with dementia living in a long-term care facility. The intervention proposed for this study is Memory Magic®. The authors of the Memory Magic therapeutic program presented at the International Society for Gerontechnology (2005) conference the results of a research study using Memory Magic (Sterns, Sterns, Sterns & Antenucci, 2005). The title of the presentation was "A low-tech intervention and therapy for large groups of persons with dementia." The research, conducted by Sterns et al. (2005), provided evidence that Memory Magic has proved its mettle as a comprehensive, therapeutic program that encourages engagement, improves affect, and reduces undesired behaviors. This writer is proposing a research study that will determine if there is an increase in knowledge when using the Memory Magic therapeutic program as the intervention.

The learning theory foundation for this study is Illeris's (2002) three dimensions of learning stated as cognition, emotional, and environment. These

three dimensions are particularly important because the participants are diagnosed with dementia, which affects participants' cognition and emotions. The plan is to rely upon the intervention to create the social environment that will quell emotion interference and leave a clear path to the participants' cognitive brain resulting in an increase in knowledge.

Research Question

The research question is: Will adults with dementia living in long-term care increase their knowledge after the intervention of playing a game program within a socially interactive environment as measured by:

1. the Mini-Mental State Exam (MMSE) scores administered as a pre-test, mid-test, and post-test?
2. the Functional Linguistic Communication Inventory (FLCI) scores administered as a pre-test, mid-test, and post-test?
3. accumulative score of the number of correct answers to questions at the beginning, in the middle, and at the end of the intervention?
4. the comparison of scores for games 1, 5, 8, 9, 10, 11, 12, 15 against game 2?

There are four corresponding hypotheses:

1. The MMSE scores will significantly increase from pre-test, mid-test, and post-test.
2. The FLCI scores will significantly increase from pre-test, mid-test, and post-test.

3. The participant's knowledge of the board game's answers will significantly increase from beginning to the middle and towards the end of the game intervention.

4. The comparison of increasing scores for games 1, 5, 8, 9, 10, 11, 12, 15 against game 2 will be significantly less.

It is anticipated that the number of positive game-playing behaviors will increase and negative behaviors will decrease. This will be presented as descriptive data.

Delimitations

The delimitations that define the boundaries of the research are sample size, research location, the number of interventions, and the level of cognitive abilities. The long-term care memory unit houses 18 residents. Some of the residents exhibit the symptoms of aphasia, apraxia, and/or agnosia creating barriers that prevent playing the game. Although there are other long-term care centers nearby, it is not feasible for clones of this researcher to conduct the interventions and testing. The number of interventions is limited by the researcher's available time. It was necessary to set the number of interventions to two per week for a contiguous 12 weeks.

Assumptions

A research plan on paper looks good; however, the implementation and flow of the plan is supported on a shaky foundation referred to as assumptions. The assumptions for this study are attendance, full and appropriate participation, the

study group represents the population, facility support will be available, side effects of medications are nil, and physical ailments will not affect participation.

Memory Abilities

Dementia can negatively impact a resident's ability to create new memories and to recall previous memories. The reader's comprehension of the proposed research study and the results in Chapter IV can be enhanced by reading the following description on how the brain creates, stores and recalls memory.

Creating memories relies first upon the use of the five senses; sight, hearing, touch, smell, and taste. Many elderly people require assistance with sight and hearing. The ability to taste can be impaired due to medications. The senses of touch and smell normally last throughout life. Sensory memories without any further processing only last a few seconds (Papalia, Sterns, Feldman, & Camp, 2007). For example, there is much a person sees throughout a day, and quickly forgotten.

Short-term memory provides the ability to remember for a short period of time. For example, a carpenter takes a measurement using a tape measure. The carpenter proceeds to the saw to cut a board to the previously measured length. While moving to the saw's location, and perhaps picking up a board, the carpenter may mentally repeat the required length. Any mental interruptions along the way might require taking the measurement again.

Transfer of new information into long-term memory requires additional processing. As an example, you meet someone and she says, "My name is" To

help transfer the name into your long-term memory, you may mentally associate the name with one of your relatives, repeat the name back to the person, and/or engage another sense such as looking at a name badge. Perhaps later you write down the person's name and the context in which you met the person. Steps like those presented will assist in transferring the person's name, face, and the circumstances in which you met, into long-term memory.

Long-term memory storage consists of explicit memory and implicit memory (see Figure 1). The explicit memory is further defined as episodic memory and semantic memory. Long-term memory cells are located throughout the cerebrum, with the majority existing in the cerebral cortex (Papalia et al., 2007). The semantic memory provides general knowledge storage and the episodic provides the context in which the knowledge was obtained. A transfer of new information to the episodic and semantic memory storage relies on a physical area of the brain named hippocampi. The hippocampi are located in the temporal lobes. The information is stored in long-term memory cells and the hippocampi are not used in the retrieval of memories (Papalia et al, 2007).

The hippocampi also serve as a memory location for spatial memories. For example, taxi cab drivers create new spatial memories when they take a patron to a location not previously located. The spatial memories from previous experiences can be recalled and enable the driver to locate a previously stored route. A symptom of damage to the hippocampi is when a person becomes disoriented

while driving or taking a walk in a familiar area. If the damage to the hippocampi increases it may prevent the ability to create new memories.

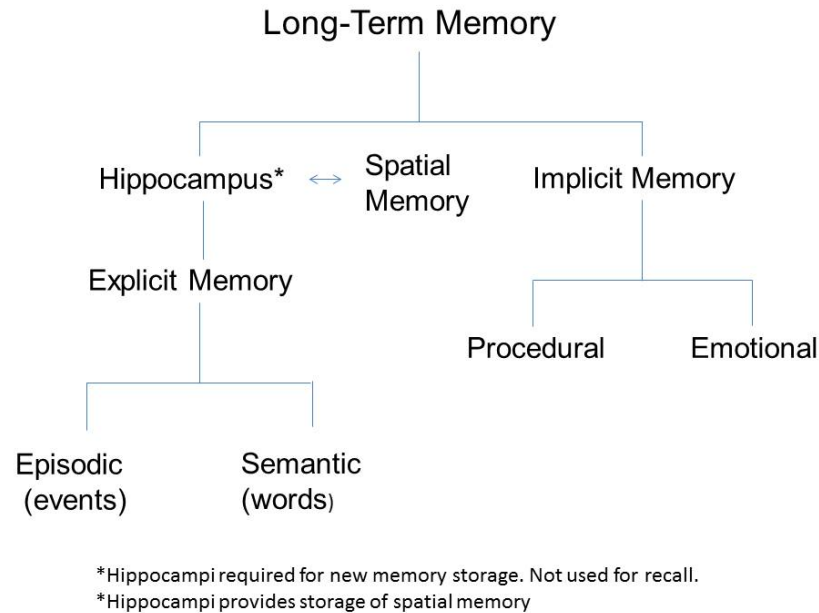


Figure 1. Long-term memory

The implicit memory consists of procedural and emotional memories. (Papalia et al., 2007). The hippocampi are not required to create new memories in implicit memory (Papalia et al., 2007). Therefore, a person with compromised hippocampi can still learn and execute behaviors. Examples of procedural memories are how to set a table, operate a piece of equipment, drive a car, etc. The emotional memory is used to store reactions to fear, anxiety, sadness, and anguish (McGill, 2014).

Definitions and Operational Terms

ADL's. Activities of daily living (Wilmoth & Ferraro, 2007). See Appendix B for list.

Agnosia. Loss or diminution of the ability to recognize familiar objects or stimuli usually as a result of brain damage (American Psychiatric Association, 2013).

Alzheimer's disease. A degenerative brain disease of unknown cause that is the most common form of dementia, that usually starts in late middle age or in old age, that results in progressive memory loss, impaired thinking, disorientation, and changes in personality and mood, and that is marked histologically by the degeneration of brain neurons especially in the cerebral cortex and by the presence of neurofibrillary tangles and plaques containing beta-amyloid (American Psychiatric Association, 2013).

Aphasia. Loss or impairment of the power to use or comprehend words usually resulting from brain damage (American Psychiatric Association, 2013).

Apraxia. Loss or impairment of the ability to execute complex coordinated movements without muscular or sensory impairment (American Psychiatric Association, 2013).

Cognition. Cognitive mental processes; a product of these processes (Craik & Salthouse, 2008)

Cognitive. Of, relating to, being, or involving conscious intellectual activity (as thinking, reasoning, or remembering) (Craik & Salthouse, 2008).

Dementia. A usually progressive condition (as Alzheimer's disease) marked by deteriorated cognitive functioning often with emotional apathy (American Psychiatric Association, 2013).

Dysphasia. Loss of or deficiency in the power to use or understand language as a result of injury to or disease of the brain (American Psychiatric Association, 2013).

Hydrocephalus. An abnormal increase in the amount of cerebrospinal fluid within the cranial cavity that is accompanied by expansion of the cerebral ventricles, enlargement of the skull and especially the forehead, and atrophy of the brain (American Psychiatric Association, 2013).

LTCA. Long-Term Care Adults

Onomatopoeia. The naming of a thing or action by a vocal imitation of the sound associated with it (American Psychiatric Association, 2013).

Plasticity. Neural plasticity is a regeneration of new neurons (McDougall, 2009).

Psychosocial. Involving both psychological and social aspects; relating social conditions to mental health (Papalia et al., 2007)

Psychological. Directed toward the will or toward the mind specifically in its conative function (American Psychiatric Association, 2013).

Sociological. Oriented or directed toward social needs and problems (American Psychiatric Association, 2013).

Summary

The population of 65 and older is increasing due to the baby boom and an increased life span. The observance and risk of dementia is prevalent in those 65 years old and older. Individuals with dementia require additional medical services including entrance into the long-term care system and increased Medicare and Medicaid expenditures. The problem is dementia and the effects are costly to individuals' quality of life. The experience of one individual in long-term care was chronicled (see Appendix A). Definitions, causes, types of dementia and its impact on those afflicted were discussed. The problem was defined, the research question was stated, and four hypotheses were listed. Delimitations and assumptions were listed. Definitions of terms associated with the dissertation topic were made available. The chapter concluded with discussion of long-term memory.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The review of the literature first presents a detailed explanation of Illeris's learning model and its applicability to cognitive stimulation of adults in long-term care. Next, research studies pertaining to the elderly population are reviewed with emphasis on sample populations, assessments, interventions and results. One particular study entitled "A low-tech intervention and therapy for large groups of person's with dementia" (Sterns et al., 2005) is especially salient as the intervention is the one applied in this research study. Following this are some additional research studies that highlight the learning theories of behaviorism, cognitivism, social cognitive, and Montessori. These learning theories are applicable to students in formal education, employees in the workplace, and adult residents in long-term care.

Illeris' Learning Model

This section presents a discussion of Illeris' learning model. Illeris's learning model incorporates cognition, emotion and environment within a societal context. Illeris (2002) refers to these as the three dimensions of learning. The basis for Illeris' model is biology, psychology and social sciences (Illeris, 2009). The biology

and psychology refer to the cognition and the emotional dimensions. There are internal conditions (the person) and external conditions (the environment).

Figure 2 identifies Illeris's dimensions of learning as cognition, emotion and environment in a societal context. The emotion consists of intrinsic motivation, a "can do" attitude (self-efficacy), and volition. Factors that can negatively impact emotion and therefore learning, are depression, sadness, and "I'm too old to learn" stance, and anger such as "I do not want to be where I currently am!" The emotion requires sensibility defined as awareness and responsiveness to the events currently taking event and the ability to maintain a mental balance that enhances internal attention and adaptation.

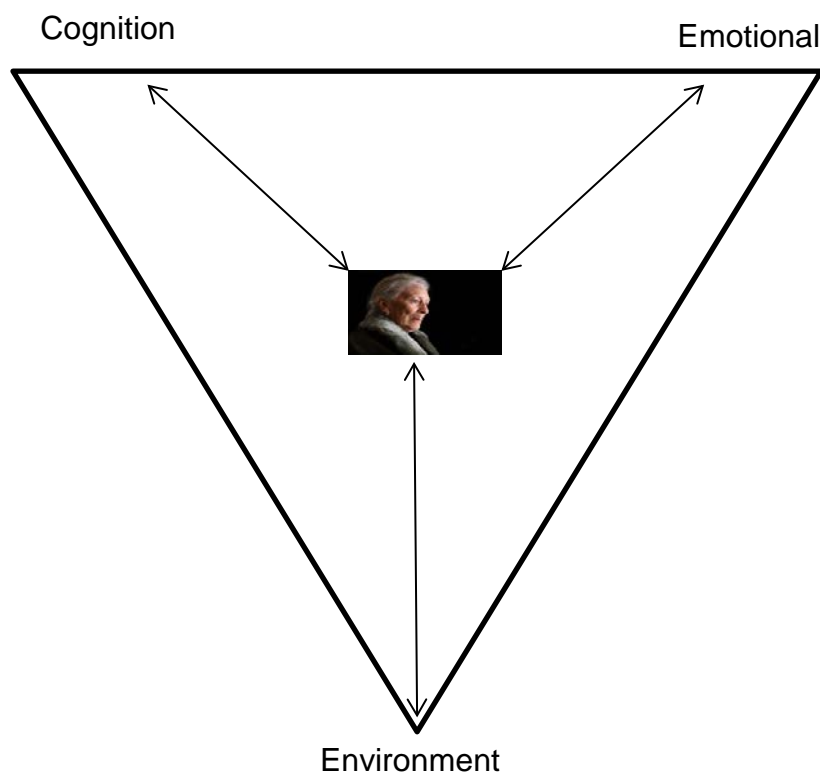


Figure 2. Three dimensions of learning, modeled after Illeris. (Illeris, 2004)

Across from emotion is cognition. The functionality of cognition is the intellectual activity such as understanding, remembering, thinking, reasoning, comparing new information to old, and memory storage. Meaning is the knowledge and ability is the skill. The interaction of emotions and cognitions taking place within the learner affects the acquisition of knowledge and skills.

The third dimension is environment which consists of the physical and social setting and the resulting external interaction that also affects the acquisition of knowledge and skills. The social includes the integration of the teachers and other learners. The three dimensions of emotion, cognition, and environment are based on societal norms and values. Society helps determine what is necessary to learn and the mastery required.

Illeris's model suggests that learning will be enhanced for a group of adults who are emotionally stable, have a desire to learn, are cognitively intact, and able to interact in a socially and physically comfortable environment. Will Illeris's model hold-up if the group of adults has mild to severe dementia? The research study defined in Chapter III may help to answer this question.

Illeris's (2002) focus on the learning process in his model identified five stimuli which he refers to as raw material of the process. The five stimuli are: transmission, perception, experience, imitation, and an activity or participation in a goal directed activity (Illeris, 2002). For example, the transmission of new knowledge can come from the environment, a person's perception is dependent on

emotion and prior knowledge, previous experiences, and the imitation and goal directed activity is enhanced through social interaction.

One can also see the five stimuli as the ingredients necessary to produce new knowledge and skills. The recipe for new knowledge and skills requires transmission, perception, experience, imitation, and an activity or participation in a goal directed activity. A mixing bowl can be used as the metaphor (see Figure 3).

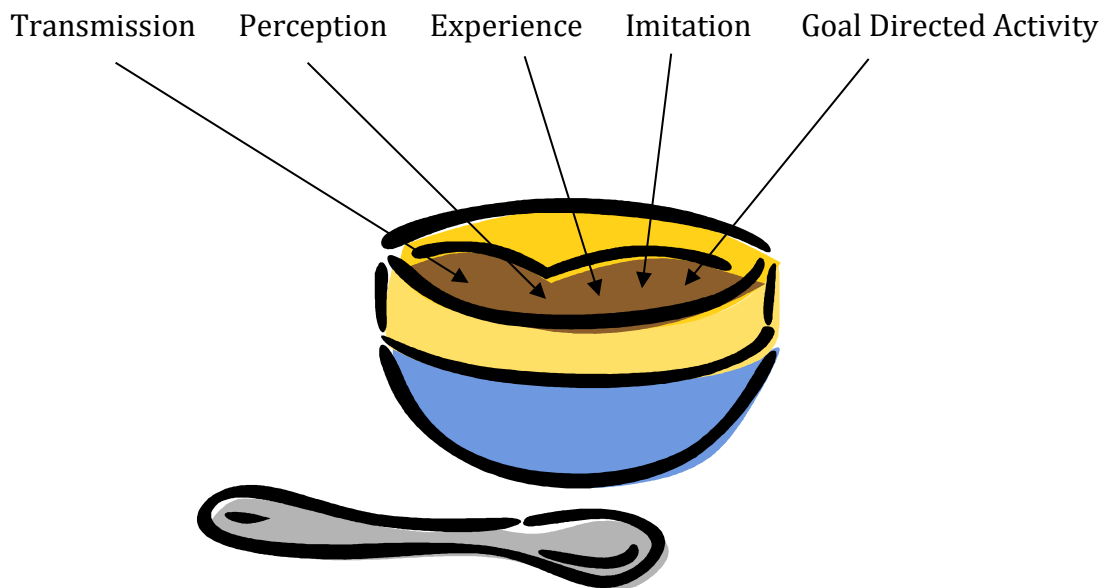


Figure 3. A bowl full of new knowledge and skills obtained, analyzed, stored, and utilized.

A college classroom application of Illeris's learning model could be a computer operating system class. The 15 students or so arrive; the professor provides a lecture and demonstration on configuring the operating system (transmission). Students with a desire to learn perceive (perception) the transmitted information coming in. A student or two may have some personal problems and perhaps are replaying in their heads the argument they had with

their significant other and miss the information disseminated. Those that perceived the information, work at applying meaning and testing their ability to recreate the skills demonstrated by the professor. The professor helps the cognitive process by asking for questions, providing clarification, and physically assisting the students. One student who missed the transmission is now more focused and is questioning and requesting the information again. The student feels (emotion) fine doing this as the classroom environment is socially friendly and feels confident that assistance will be provided. Some students have prior experience (experience) and are able to use their current knowledge to assimilate and/or accommodate the new knowledge and/or skill. During the hands-on lab (goal directed activity) portion of the class one student may ask another for assistance. This may result in imitating (imitation) the other student's actions. Learning has occurred in the classroom for most of the students because they were emotionally ready, were able to apply meaning to the knowledge, were not shy about asking for assistance, and practiced the skills.

Illeris's model as applied in a classroom with students who are cognitively intact, emotionally stable, willing to socially interact, and a teacher with good pedagogical skills to mix the ingredients of transmission, perception, experience, imitation, and goal directed activity can result in new knowledge and skills. How well will this model apply to adults diagnosed with dementia and perhaps emotionally unstable as manifested through their inappropriate behaviors? Can a

strong social environment compensate for the weaknesses of cognition and emotion and create the ability for the adults to learn?

Reviews of Elderly Cognitive Function Research

This section describes several different studies that highlight the sample populations, the assessments, the interventions and the results when researching the cognitive functions of the elderly. The dates of the studies range from 2000 to 2010.

Clare and Woods (2004) helped clarify the types of cognitive interventions and the process of designing and applying interventions that are specific to a brain domain with the use of assessments for pre and post measuring the domain of interest. The 10 domains are: achievement, adaptation, attention, cognitive, executive function, language, memory, motor, sensory, and social communication (Lang, 2006). For example, a common approach is to focus an intervention on the memory domain and then assume and pray that an increase in memory capabilities is beneficial or at the least benign for the remaining nine brain domains.

Three classes of cognitive interventions suggested and defined by Clare and Woods (2004) encompassed cognitive stimulation, cognitive training, and cognitive rehabilitation. The cognitive stimulation concept is that the intervention will affect most of the cognitive domains. An example of a cognitive stimulation application is Bingo. Playing Bingo stimulates the mind through the domains of attention, cognition, executive functioning, language, memory, motor, sensory, and social communication. Bingo is also a group activity and invites social interaction.

Because of the broad impact, it is difficult to determine a cause and effect for changes in any one domain. It is akin to shooting a shotgun and then trying to determine which bb had the greatest effect. Bingo is an activity enjoyed by most residents.

Cognitive training can target a specific domain with spillover effects on other domains. Examples of cognitive training interventions are name-face recognition exercises, visual-acuity exercises, physical exercises providing improvement of motor skills, and instructions on performing activities of daily living. Interventions can be delivered person to person, computer to person, family interaction with the individual, and within a group with a skilled leader such as an activity aide at a long-term care center. A computer program such as Lumosity™ can exercise the domains of achievement, adaptation, attention, cognitive, executive function, memory, motor, and sensory. It is also possible the individual can perform practice exercises on their own using printed material such crossword puzzles, word finds, *Dental Floss for the Mind* (Noir & Croisile, 2005), and *Brain Games* (Cohen & Reynaldo, 2010). A major example of cognitive training is the National Institutes of Health (NIH) Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE). ACTIVE focuses on improving the memory, reasoning and processing speed cognitive functions.

Cognitive rehabilitation takes into account the individual's requirements based on physical, psychosocial, and cognitive levels. It can be considered a person-centered intervention. A goal of rehabilitation is to provide an individual with

enabling skills and knowledge that allows an acceptable interaction with the environment. The interventions can build on a person's strengths and improve weaknesses. The interventions may require the creation of job aids, memory aids, and strategies that enable persons to compensate for their cognitive impairments. Cognitive rehabilitation is typically used for persons that have suffered a stroke.

In summary, the three classes of cognitive interventions are; stimulation, training, and rehabilitation (Clare & Woods, 2004). The next several pages will present research studies pertaining to cognitive stimulation and cognitive training.

Cognitive Stimulation

A study that utilized cognitive stimulation is "Efficacy of a Cognitive intervention for the Therapeutic Treatment of Mild to Moderate Alzheimer's Disease" (Ashby, Buss, Firmstone, & Brand, 2008). The research intervention was an individualized cognitive stimulation applied to participants (n = 50) with an age greater than 70 and diagnosed with early to moderate dementia of the probable Alzheimer's type. The intervention was person centered with the design and content dependent on interviews with the participant and the participant's family. The interventions were applied one on one by a facilitator, twice weekly, 45–60 minutes and continued for 52 weeks. Over the 12-month period, the MMSE (Folstein, Folstein, & McHugh, 1975) score increased 1.98 points despite the progressive nature of Alzheimer's disease, with most of the gain noted at 3 months

The research was conducted at five test sites located in Nevada, Florida, New Hampshire, Vancouver, and Calgary. The participants were located in assisted living

facilities, retirement residences, or living at home with private care. The MMSE was administered as a baseline pre-test, and then at 3 months, 6 months, 9 months and 12 months. The participants' initial MMSE scores ranged from 10-27 with a mean of 22.36. Pharmacological interventions had been in place for at least 3 months, and they were not receiving any other defined type of cognitive interventions.

The results showed a mean increase from the MMSE baseline level of 22.36 to 24.34. A one-way repeated measures analysis of variance was conducted. The main effect of Time was statistically significant. Although a control group was not used, a comparison was made against the annual rate of change (ARC) for MMSE scores obtained from persons with Alzheimer's disease. Han and colleagues, as cited in Ashby et al. (2008), noted that an average decline of 3.3 points is expected. This suggests that the research subjects' MMSE scores were 5.28 points higher than expected for individuals with Alzheimer's disease.

Cognitive Stimulation and Cognitive Training

The "Preserving Cognition through an Integrated Cognitive Stimulation and Training Program" study used computer based cognitive stimulation and cognitive training augmented with paper and pencil exercises (Eckroth-Bucher & Siberski, 2009). The subjects, age 65 or older, were recruited from retirement communities, nursing homes, personal care facilities, and an Alzheimer's disease unit. Inclusion requirements included the ability to use a computer mouse and touch screen. The sample population was divided into an experimental group and a wait-list control group. The final number was $n = 15$ for experimental and $n = 17$ for the control. The

groups were further classified as no cognitive impairment, mild impairment, and moderately impaired.

The cognitive training was brain domain specific with a hypothesis that the training will spill over into other domains. The intervention used was the Integrated Cognitive Stimulation and Training Program (ICSTP) (Eckroth-Bucher & Siferski, 2009). This is an intervention designed by the researchers. The researchers are looking for cognitive gains in mental status, dementia scores, short-term and long-term memory, and delayed recall.

The cognitive interventions consisted of pencil and paper exercises and computer-based exercises. The exercises were selected to affect different brain domains. Table 2 identifies the exercises and the targeted brain domains.

Table 2. Exercises and targeted brain domains

| Exercises | Domains Affected |
|--|---------------------|
| Hidden picture drawings, mazes and geometric mazes | Sensory (visual) |
| Crossword puzzles, categorizing, math calculations | Cognition |
| Word find, anagrams, eliciting facts | Language |
| Memory recall of prose and sentence completion | Memory |
| Search a word puzzles, picture, and name-face recognition | Memory |
| Appraisal, determining solutions, decision making | Cognition |
| Following directions, using yellow pages, selections | Attention |
| Physically arranging items, selection of appropriate clothing, writing directions, managing money, stock portfolio, writing checks | Memory (procedural) |

The MMSE, Dementia Rating Scale (DRS), and the Logical Memory I (LMI), Logical Memory II (LM II), Letter-Number Sequencing (LNS) subscales of the Wechsler Memory Scale III were used for pre and post assessments. The MMSE was used to measure cognitive status, the DRS is a neuropsychological measure of cognitive status, and the subscales from the Wechsler instrument were used to measure immediate and delayed memory in the auditory dimension. The delivery of the intervention took place on 2 consecutive days for 45 minutes over a 6-week period.

The mean score results were significant for the pre-test, post-test scores obtained from the DRS ($p = .001$), LMI ($p = .002$), and LMII ($p = .007$) and the results from an 8-week post-test non-significant with the immediate post-test. In other words, the gains obtained from the ICSTP intervention were still present after eight weeks. The authors/researchers concluded that the results indicated the mild/moderate cognitively impaired can learn and maintain their cognitive and functional abilities.

Cognitive Training 1

The National Institutes of Health (2001) sponsored a study titled “Advanced Cognitive Training for Independent and Vital Elderly” (ACTIVE) (Willis & Marsiske, 2006). The number of participants was 2,802. The participants were divided into four groups. One group received training on memory, another group received training on reasoning, and the third group received training designed to improve speed of processing. The fourth group was the control group with no interventions

given. Members of the three experimental groups scored higher on the assessments than those in the control group. The assessments were administered to provide baseline data, completion of training data, and post-test data on a yearly basis for 5 years. The downside of the study was that the cognitive domain specific increases did not translate into significantly increasing the abilities of the participants in performing the Instrumental Activities of Daily Living (IADL's), however their IADL's abilities were higher than those in the control group and significantly so for the group receiving reasoning training. Examples of IADL's are; shopping, preparing meals, transportation, money management, housework, and use of communication equipment. The brain domains targeted by the interventions were memory, reasoning, and speed of processing. The memory training intervention consisted of teaching participants the mnemonic strategies of organization, visualization and association. The information to be remembered consisted of verbal material such as word lists and text. The reasoning intervention consisted of teaching the participants on finding word and letter patterns and predicting the next item in the series. The speed of processing training used computers to present visual information that required the participant to divide their attention between two objects. Application of the training included remembering a shopping list and deciphering a bus schedule. There were 10 initial training sessions lasting for 60–75 minutes with booster sessions at 11 months and 35 months.

The assessments measured cognitive outcomes and functional outcomes. The three measures used for memory were Hopkins Verbal Learning Test, Rey

Auditory-Verbal Learning Test, and the Rivermead Behavioral Paragraph Recall test. The reasoning measures included tests on letter series, letter sets, and word series. The speed of processing measure involved three useful field of view subscales.

The functional outcomes were measured with self-administered assessments of six levels of difficulty on executing the Minimum Data Set-Home Care (Lawton, Holmes, & Ory, 1997; as cited in Willis et al., 2006). The tasks assessed on, included finances, shopping, using the telephone, preparing meals, house cleaning and health care. In addition, participants were assessed in their ability to perform common everyday tasks, use printed materials, behavioral simulations contained in the Everyday Problem Test (Willis et al., 2006), and the Timed IADL Test (Owsley, Sloane, McGwin, & Ball, 2002).

Cognitive Training 2

The article “Cognitive Interventions Among Older Adults” reviewed psycho-educational and psychosocial interventions as applied to adults not afflicted with MCI or dementia (McDougall, 1999). The intervention was designed to increase the effective use of the memory domain. Memory is a concern of the elderly because they are cognizant of the fact they have problems recalling and they are aware that they may lose their independence. Therefore, many are willing candidates for receiving memory training. The memory training mentioned in the article was designed to improve memory performance through the use of mnemonics.

A sample (n = 145) of community dwelling adults with a mean age of 71 were recruited for the study. The research sample was split into an experimental group (n = 74) and control group (n = 71). All participants were pre-assessed with the Metamemory in Adulthood Questionnaire (MIA). This instrument is designed to measure affect, beliefs, and knowledge. The participants were also assessed with the Geriatric Depression Scale (GDS). The memory training intervention was applied over a 2-week period with two sessions per week. The training taught the participants how to utilize mnemonics to improve the functions of free recall, recognition, and cued response. The MIA was given as a post-test at the completion of training and a follow-up 2 weeks later. The experimental group exhibited significant improvement on the MIA post-test. Those in the experimental group with low scores on the GDS obtained lower MIA scores on the follow-up assessment while those without depression maintained their MIA post-test score.

Cognitive Training 3

A study entitled “Rehabilitation of Memory and Memory Self-Efficacy in Cognitively Impaired Nursing Home Residents” used the Cognitive Behavioral Model of Everyday Memory (CBMEM) as a memory domain intervention (McDougall, 2001). Poor memory performance can be caused by dementia, depression, lack of confidence, low intrinsic motivation, anxiety, and little knowledge on how to retain and recall information. A person who believes they are losing their ability to remember can result in increased depression. In addition, living in a setting with 24-hour care can increase self-helplessness. The research

question was; will the CBMEM intervention increase memory self-efficacy and memory performance for the experimental group? The measures used to pre and post assess the experimental group ($n = 30$) were the MMSE and the MIA. The initial MMSE scores ranged from 10 to 30 and the pre MIA scores indicated an unstable memory. In addition, the Rivermead Everyday Behavioral Memory (RBMT) and the Memory Self-Efficacy Questionnaire (MSEQ) were administered.

The length of the study was 4 weeks with two sessions per week. Seventeen of the original experimental group dropped out of the study and only two subjects attended all eight classes. The improvement in over-all pre-test/post-test scores was non-existent, however the individual test item of immediate story recall showed a significant increase ($p < .05$) and there was a significant increase ($p < .0001$) for memory self-efficacy.

Cognitive Training 4

The CBMEM mentioned in the preceding study is more fully explained in “A Framework for Cognitive Interventions Targeting Everyday Memory Performance and Memory Self-efficacy” (McDougall, 2009). Memory complaints from the elderly is not only a reflection of the brain’s physical aging process or a dementia disorder, but can also be attributed to the individuals’ self-efficacy and the presence of depression. McDougall (2009) refers to the CBMEM as a psychosocial intervention and it contains elements of Bandura’s (2001) social cognitive learning theory. A goal of the CBMEM intervention is to increase a person’s confidence in their ability to remember. McDougall (2009) stated, “the CBMEM is a psychosocial intervention

that emphasizes cognitive and behavioral aspects and combines a unique package of cognitive skill development in exposure, repeated practice, relevant modeling, self-modeling, cognitive skill modeling, exhortation, suggestion, and desensitization” (p. S19).

Figure 4 was derived from text contained in Bandura (2004), McDougall (2001; 2009). Bandura’s (2004) input includes the use of enactive (learning by doing) and vicarious (learning by observing) as a method of increasing self-efficacy for a specific task. The outcome is performance (behavior) by the individual with environmental cues from the therapist (teacher).

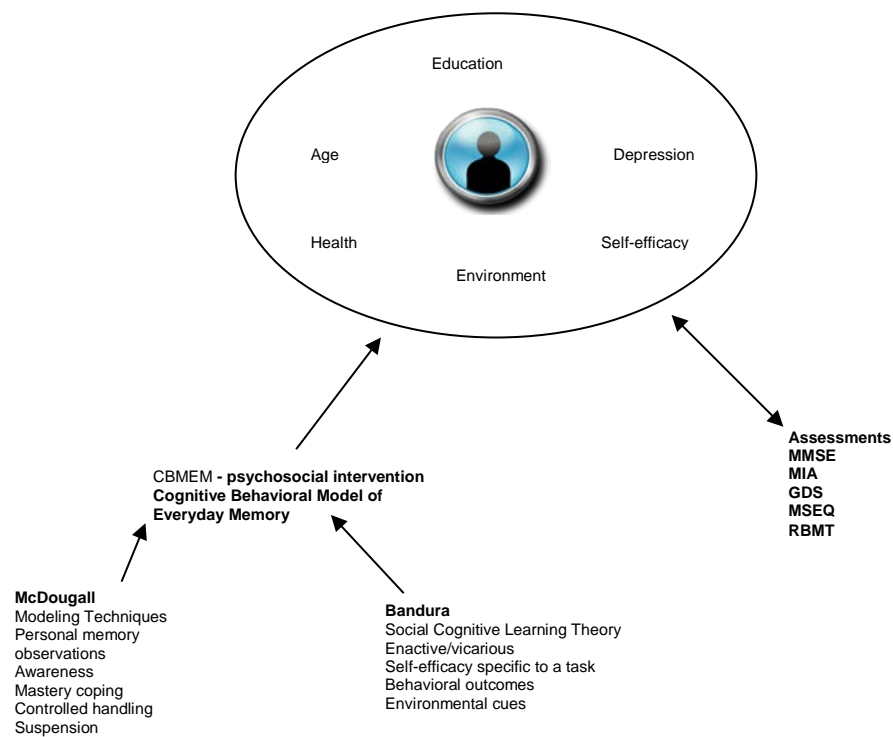


Figure 4 . Cognitive-Behavioral Model of Everyday Memory (CBMEM). Derived from McDougall, 2001; 2009.

The cognitive training applied through the CBMEM (McDougall, 2009) process proceeds through six stages identified as (a) modeling techniques, (b) observing their memory, (c) awareness, (d) mastery coping, (e) controlled handling, and (f) suspension. Each stage is progressively more challenging. A modeling stage consists of playing emotionally non-threatening games that are cognitively easy. These games typically involve the use of language. An example of a game is to ask the group to identify an item in the room that is blue in color or to identify an item in the room that ends with a specific letter. The process of playing these games and the interaction with others move the individuals into the observing their memory stage. The result is, the participants begin to realize the strength of their memory. The third stage, awareness, brings the participants to an understanding that attention and concentration is vital for using memory and that a comment from one participant can trigger additional comments from themselves and others. An example of an exercise is the “last letter” game in which one person says a word and the next person or anyone in the group has to respond with a word that begins with the last letter of the word given. In the mastery coping stage the leader will begin to challenge the memory recall abilities of the group. For example, the group may be shown a sentence, read the sentence, and then with the sentence out of sight be asked to state the last word or provide the answer to a question such as “what was the color of the car mentioned in the sentence.” The fifth stage is controlled handling. Here, the leader begins to call on individuals to recall the answer to a specific question. The goal here is to increase the participants’ self-

efficacy for specific tasks. In the suspension stage, the participants practice relaxing their emotions such as anxiety or defensiveness, when they are asked to recall an answer to a question.

The outcomes are increased confidences in over-all memory abilities and increased self-efficacy for specific tasks.

In summary, the elderly cognitive function research study reviews included studies and articles focused on cognitive stimulation and cognitive training for adults over 65 with cognitive deficiencies. The cognitive interventions mentioned in the studies were:

- Individualized cognitive interventions
- Cognitive exercises such as: puzzles, word find, crossword puzzles, geometric designs, name-face recognition, appraisals, determining solutions, decision making, physical arrangements, math calculations, following directions, managing personal affairs, and the Integrated Cognitive Stimulation and Training Program.
- Domain specific interventions such as the Cognitive Behavioral Model of Everyday Memory (CBMEM) and Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE).

The interventions were delivered via paper and pencil and computer simulations presented to individuals and groups.

The cognitive assessments mentioned in the studies were:

- Mini Mental State Exam (MMSE)

- Dementia Rating Scale (DRS)
- Wechsler Memory Scale III
- Shortened version of 12 indices that targeted locus of control
- Hopkins Verbal Learning Test
- Rey-Auditory Learning Test
- Rivermead Behavioral Paragraph Recall
- Minimum Data Set-Home Care
- Everyday Problem Test
- Timed IADL Test
- Complex Reaction Time Test
- Metamemory in Adulthood Questionnaire (MIA)
- Geriatric Depression Scale (GDS)
- Memory Self-Efficacy Questionnaire (MSEQ)

Learning Theories Applied in Research Studies

This section presents research studies based on the learning theories of learning theories of behaviorism, cognitivism, humanism, social cognitive, and Montessori. The first two studies incorporate a spaced retrieval pedagogy. The third and fourth research articles speak to the application of cognitivism. The fifth research study focused on humanism and the final two studies highlight use of the social cognitive and Montessori learning theories.

Two research articles pertaining to behaviorism using a spaced retrieval pedagogy are “Expanding Retrieval Practice Promotes Short-Term Retention, but

Equally Spaced Retrieval Enhances Long-Term Retention” (Karpicke & Roediger, 2007) and “Booster Sessions Enhance the Long Term Effectiveness of Spaced Retrieval in Older Adults with Probable Alzheimer’s Disease” (Cherry, Hawley, Jackson & Boudreaux, 2009).

A summary of Karpicke and Roediger’s (2007) study will be presented first. The research subjects were college undergraduates, ages 18 -22. The researchers’ desired a healthy brain and individuals who were cognitively active. The learning and testing process required matching word pairs. The word pair example given in the article was sobriquet-nickname. The test required the person to recall the word pair when presented with one of the words. The learning trials included equally spaced recall and expanding recall. The tests were given at time periods of 10 minutes and 2 days. The result was that the expanding recall method produced higher scores on the 10-minute test as compared to the group learning with equally spaced recall. However, the opposite condition was noted for the 2 day test as the scores were better for the equally spaced group. The results indicate expanding recall promotes short-term retention and equally spaced recall enhances the longer-term retention. The results imply that it may be advantageous to apply expanding recall first and then switch to equally spaced recall to obtain the long term recall.

The expanding recall can produce success for an adult with dementia and produce a psychologically positive emotion along with praise from the occupation

therapist. When the short-term recall limit is reached, the therapist can use that time period for the equally spaced time interval to enhance long-term recall.

Another spaced retrieval study (Cherry et al., 2009) explored the effect of booster sessions on enhancing the long-term recall ability. Six subjects from adult day care and long-term care diagnosed with mild to moderate AD were selected. They were administered the Mini-Mental State Exam (MMSE) and the Geriatric Depression Scale (GDS). The test subjects were taught name-face recognition using expanded spaced retrieval. The experimental group and the control group received the initial training. The experimental group received booster sessions at 6 weeks, 12 weeks, and 18 weeks after the initial training. A 6-month retest of the experimental and control group revealed that the experimental group performed significantly better. This experiment demonstrates the efficacy of equally spaced booster sessions using expanded spaced retrieval on long-term memory recall.

In summary, behaviorist interventions such as spaced retrieval are applicable to adults with dementia. The primary reason is because the implicit memory, where procedures are stored and recalled, remain intact until the later stages of dementia. Spaced retrieval can be used for name face recognition. The picture is shown to the long-term care adult and they are trained to respond with the correct name. In some respects, this may seem that explicit memory is being used when learning and recalling. However, the behaviorism approach is that of stimulus-response and similar to a procedure.

Another study titled “Immediate and delayed effects of cognitive interventions in healthy elderly: A review of current literature and future directions” (Papp, Walsh, & Synder, 2009) is a meta-analysis study of research on the effects of cognitive training applied to community-dwelling cognitively healthy elderly. In the article, cognitive training was defined as “teaching theoretically motivated strategies and skills in order to optimize cognition functioning” (Belleville, 2007, p. 1). The authors searched for research articles in MEDLINE, Scopus, The Cochrane Collaboration, Dissertation Abstract International, PsycINFO, and Current Controlled Trials and Clinicaltrials.gov. Ten studies published between 1996 and January 2008 were located that met the inclusion and exclusion criteria specified in the article. The authors desired to determine from their meta-analysis study if cognitive training provided an improvement in over-all cognitive functioning. Unfortunately, the interventions were targeted for specific domains such as memory and visual spatial function and follow-up studies only occurred in 5 of the 10 studies. The research authors concluded that there was no evidence from the meta-analysis that indicated cognitive training programs delayed or prevented the occurrence of dementia in community-dwelling cognitively healthy adults.

Another pertinent study is “Memory awareness among Japanese nursing facility residents” (Ide, McDougall, & Wykle, 2003). The construct of metamemory is used in the study. When persons begin to focus on their forgetfulness and begin thinking about their memory ability and processes they are in the arena of

metamemory. The purpose of the study was to investigate the metamemory of residents and the influence of depression and physical health on metamemory and self-determined interventions. Cognitive function was measured using the MMSE, the GDS measured depression, the Health Scale, a subscale of the Multiple Assessment Instrument, measured health status, and five of the seven scales of the Metamemory in Adult Questionnaire (MIA) were used to measure metamemory. The five subscales were achievement, capacity, change, locus, and strategy. The sample consisted of 117 residents in seven different nursing homes in the Tokyo area. The participants were separated into two groups based on MMSE scores of no cognitive impairment and mild cognitive impairment. The two groups were further divided into three groups based on their GDS score category of none, mild and severe. The scores on the MMSE, GDS, and Health Scales were compared against the MIA. The level of depression negatively affected the MIA subscales of memory capacity and change. An analysis of variance between the three subgroups of the two cognitive level groups revealed a significant difference between the two subscales of locus and strategy. This indicates cognitively impaired with no depression perceive more control (locus) over their memory than the cognitively intact with no depression. For the subscale of strategy, the results indicate the cognitively intact use memory strategy more often than the individuals with MCI.

A research study titled "Dementia program effectiveness in long-term care" (Rosewarne, Bruce, & McKenna, 1997) examined the effect of dementia programs on hostel dwelling residents located in Australia. A hostel is a supervised

institutional residence similar to assisted living facilities in the U.S. Dependent variables included MMSE and GDS scores, staff-rated indices such as ADL's, problem behaviors, psychiatric symptomology, health status and time to nursing home placement. Residents were assessed with the MMSE and GDS three times. An experimental group and a control group were used for the study. The experimental group consisted of individuals (n = 184) living in hostels (n = 29) that had a dementia program in place and a control group (n = 162) living in hostels (n = 29) without a dementia program. The study took place over a 24-month period. 53.6% of the residents remained for the three assessment tests.

The results indicated the individuals in the experimental group were able to continue to live in the hostel environment for a longer period of time than those individuals in the hostel without a dementia program. Throughout the study, MMSE scores showed a consistent decline, as did mobility, motivation, and ADL. Mobility and ADL demonstrated the fastest decline. The dementia programs were designed to emphasize a social model of care. The additional staff focused on the social, psychological, and emotional needs of the residents. Qualitative outcomes indicated an increase in resident self-esteem and a sense of purpose. Perhaps if the additional staff had also focused on the resident's cognitive needs, the decline of the MMSE scores may have been different.

This next study is interesting because persons with dementia were trained to lead others with more advanced dementia in a reading exercise. This is a Montessori approach as more capable others are helping those less capable. The

title of the study is “Resident-Assisted Montessori Programming (RAMP™): Use of a small group reading activity run by persons with dementia in adult day health care and long-term care settings” (Skrajner & Camp, 2007).

Six individuals recommended by activity coordinators were selected as leaders. Their MMSE scores ranged from 13 to 21 and ages ranged from 75 to 93 years old. They were trained to lead a Montessori based reading activity called Question Answer Reading (QAR). A total of 22 participants attended the QAR sessions. On average, the participants’ MMSE scores were 2 points lower than the leaders. The trained leader provided guidance to the participants by giving each person a story booklet and then asking each person to read a portion of the story. After the story reading was completed, the leader passed out discussion cards. The discussion question was read and the leader prompted for relevant discussion.

Data from the participants was collected using the Menorah Park Engagement Scale (MPES). The behavioral instrument has 11 items, 6 of which were used for this study. The six items were: constructive engagement, passive engagement, non-engagement, other engagement, affect indicating pleasure and affect indicating anxiety/sadness. Definitions and scoring were stated in the research study article.

Leaders were assessed on the tasks of passing out the stories, asking someone to read the next section, and initiating discussion. The “passing” criteria were that they demonstrated partial adherence to the procedures in 80% of the sessions. Three of the six leaders demonstrated full adherence in 80% of the

sessions. The leaders made personal impromptu statements pertaining to their satisfaction of being a leader.

Memory Magic Therapeutic Program Intervention

A research study conducted by Sterns et al. (2005) used a game as an intervention to act upon the social ability of long-term care adults. The name of the game program is Memory Magic®. The website www.memorymagic.com (2011) introduced Memory Magic as a “comprehensive, therapeutic program for people with a range of cognitive abilities” (Engage & Stimulate, [para. 1]). The Memory Magic therapeutic program was developed by Creative Action LLC. The Memory Magic therapeutic program encourages Montessori principles through assistance from one player to another. The act of playing promotes social interaction and generates positive emotions. The program is in use at more than 1000 facilities nationally and internationally.

The authors presented the results of research studies at the International Society for Gerontechnology (2005) conference. The title of the presentation is “A low-tech intervention and therapy for large groups of persons with dementia.”

The hypotheses for the study were “individuals engaged in Memory Magic display fewer frequencies of problematic behaviors, more positive affect, and greater engagement with their physical and social environments compared to when they are taking part in standard activities” (Sterns et al., 2005). The Menorah Park Engagement Scale (MPES) (Camp, 2002) was used to measure the level of engagement. Observations were used to determine the baseline levels of time spent

in activities, quality of engagement in activities, activities successfully completed, affect displayed in activities, and problem behavior displayed during activities. There were 133 subjects across three types of facilities; assisted living, adult day care and nursing home care.

The Memory Magic therapeutic program was played twice a week for one hour and this continued for 12 consecutive weeks. Subjects were observed while playing Memory Magic and during the time periods used for other activities such as Bingo and sing-alongs. The observation data was entered using the MPES assessment.

The results were that the level of the dependent variable engagement was higher when playing Memory Magic compared to other group activities. In addition, the occurrences of individuals engaging in behavior not related to the game were fewer compared to other standard activities. The other dependent variable of expressing affect increased compared to the other standard group activities.

The hypotheses for the study were “individuals engaged in Memory Magic show lower frequencies of problematic behaviors, more positive affect, and greater engagement with their physical and social environments compared to when they are taking part in standard activities” (Sterns et al., 2005). The results of the study found these hypotheses to be true.

The website (www.memorymagic.com) also contains links to testimonials pertaining to the Memory Magic therapeutic program. These testimonials include statements indicating residents have benefited through reduced behaviors such as

wandering and agitation. One testimonial (Hamel, 2009) indicated that a resident who has been playing the game had not spoken a complete sentence in a long time suddenly started to do so. This testimonial appeared in an article titled "Game providing residents with social and emotional benefits." Another testimonial (Schaefer, 2007) goes further beyond the behavioral benefits of the Memory Magic therapeutic program and in to the cognitive realm by referring to the program as a brain program. The gerontology director of dementia care services stated:

Residents with dementia often have problematic behaviors such as wandering and agitation because they are bored. Memory Magic gives patients who are prone to these behaviors something to do to keep them busy while also helping to improve their memory (Atwood, 2007, p. 18).

The research conducted by Sterns et al. (2005) provided evidence that Memory Magic has proved its mettle as a comprehensive, therapeutic program that encourages engagement, improves affect, and reduces undesired behaviors. Others have utilized the program and are reporting that there seems to be a cognitive benefit to the participants. The writer is proposing a research study that will determine if there is an increase in cognition and subsequent learning as a result of using the Memory Magic therapeutic program for the intervention.

Summary

Chapter II presented information on Illeris's three dimensions of learning model and reviews of articles and studies pertaining to cognitive stimulation, training, and rehabilitation of adults in long-term care. Additional research studies

focused on the learning theories of behaviorism, cognitivism, humanism, and social cognitivism. Table 3 summarizes the study titles and learning theories.

Table 3. Summary of studies and utilized learning theories

| Article Title | Learning Theory |
|---|-----------------------------------|
| Expanding Retrieval Practice Promotes Short-Term Retention, but Equally Spaced Retrieval Enhances Long-Term Retention | Behaviorism |
| Booster Sessions Enhance the Long Term Effectiveness of Spaced Retrieval in Older Adults with Probable Alzheimer's Disease | Behaviorism |
| Immediate and delayed effects of cognitive interventions in Healthy elderly: A review of current literature and future directions | Cognitive |
| Memory Awareness among Japanese nursing facility residents | Cognitive |
| Dementia Program Effectiveness in Long-term Care | Cognitive |
| Resident-Assisted Montessori Programming (RAMP) | Social Cognitive Montessori |
| A low-tech intervention and therapy for large groups of persons persons | Social Cognitive Montessori |

CHAPTER III

RESEARCH METHODOLOGY

Chapter III commences with stating the research purpose, research questions, and hypotheses. The chapter also explains the research design with subheadings of sampling, demographics, pre-testing, intervention, intervention application, mid-test, post-test and scoring. The chapter continues with a discussion of data analysis. The study limitations are presented next, followed by reviews of the MMSE (Folstein, Folstein, & McHugh, 1975) and FLCI (Bayles & Tomoeda, 1994) cognitive assessments.

Purpose

The purpose of this experimental research study was to determine if there is an increase in knowledge of the correct answers to the game questions and sayings, after participants in an interactive long-term care environment were given an emotional therapeutic intervention in the form of a game. Knowledge refers to the storage and recall of the correct answers to the game's questions and the ability to play the game. Knowledge was measured with a written pre-test, mid-test, post-test of the same questions and sayings responded to when the participants were playing the games and the demonstrated learned behaviors observed during the game intervention.

An increase in knowledge implies that learning took place. According to Illeris (2004) and Ormrod (1995),

in psychology and education, learning is commonly defined as a process that brings together cognitive, emotional, and environmental influences and experiences for acquiring, enhancing, or making changes in one's knowledge, skills, values, and world views (as cited in Merriam, Cafferella, & Baumgartner, 2007, p. 277).

The research participants experienced the game intervention within a socially interactive environment. Information enters the participants through their five senses. Cognition is the ability to recognize the information and obtain, use, store, and recall knowledge and skills and cognition is required for learning to take place (Illeris, 2002).

Salthouse (2008) presents information on a study titled Seattle Longitudinal Study. The study measured the impact of age on the cognitive functions of reasoning, spatial, perceptual speed, episodic memory, and vocabulary. The results showed declines in reasoning, spatial, perceptual speed and episodic memory as age increased. Interestingly, the vocabulary ability remained relatively stable. This is good news, because the research intervention is language based. For persons with dementia of the Alzheimer's type (DAT), the social communication and language domains, and the implicit and procedural memory remains intact through the early stages to moderately severe levels of dementia (Craik & Salthouse, 2008).

The research question was: will adults with dementia living in long-term care increase their knowledge after the intervention of playing a game program within a socially interactive environment as measured by:

1. the MMSE scores administered as a pre-test, mid-test, and post-test.
2. the FLCI scores administered as a pre-test, mid-test, and post-test.
3. accumulative score of the number of correct answers to questions at the beginning, in the middle, and at the end of the intervention.
4. the comparison of scores for Games 1, 5, 8, 9, 10, 11, 12, 15 against Game 2.

In addition, descriptive data on game-playing behaviors was collected.

There were four corresponding hypotheses:

1. The MMSE scores will significantly increase from pre-test, mid-test, and post-test.
2. The FLCI scores will significantly increase from pre-test, mid-test, and post-test.
3. The participant's knowledge of the board game's answers will significantly increase from beginning to the middle and towards the end of the game intervention.
4. The comparison of increasing scores for Games 1, 5, 8, 9, 10, 11, 12, 15 against Game 2 will be significantly less.

Also, it was anticipated that the number of positive game-playing behaviors would increase and negative behaviors would decrease. This was presented as descriptive data.

Research Design

An experimental design is typically used to determine the effect of an intervention on dependent variable(s). Gall, Gall, and Borg (2003) stated that “experiments provide the most rigorous test of causal hypotheses” (p. 366). The experimental design for this education research project was a pre-test, intervention, mid-test, intervention, and a post-test and a within-subjects with two measures, and each subject serving as their own control. This within-subjects approach with each individual serving as their own control is most appropriate given the limited number of available participants and the variability between participants such as their prior life experiences and educational backgrounds.

The research design incorporated the recruitment and selection of the study group participants, completion of a pre-test, application of the intervention, a mid-test, and a post-test. The research design of the study is shown in Figure 5 and explained within the next few pages.

Sampling

The design commences with the recruitment of residents in a long-term care memory unit located in the Midwest. The residents have a medical diagnosis of dementia. The individuals living in the memory unit have a legal guardian or power of attorney (POA). The guardians or POA’s were contacted and asked to sign a letter of consent for the research subject and a Health Insurance Portability and Accountability Act, 1996 (HIPAA) authorization form allowing the researcher to view the resident’s medical record. A copy of the consent form, the HIPAA

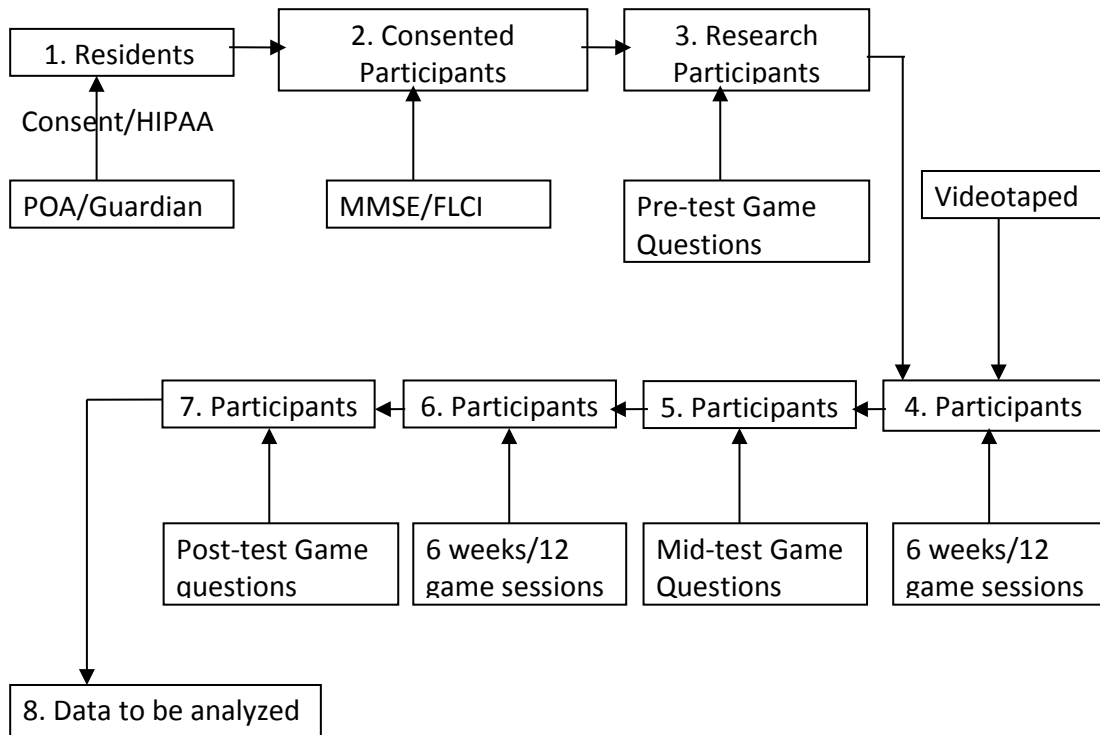


Figure 5. Research Study Design

authorization form, and the Institutional Review Board (IRB) approval letters are shown in Appendices G, H I and J. There was a convenience sample size of eight consented participants.

Pre-testing

This was to determine the consented participants' current cognitive status using the cognitive assessments of the Mini-Mental State Exam (MMSE) and the Functional Linguistic Communication Inventory (FLCI). The results from the assessments were used to determine the severity of the participant's dementia from mild to severe and were reported as demographic data. Next, the research

participants were administered a written pre-test consisting of questions from the game intervention.

Intervention

The name of the game intervention is Memory Magic®. The website www.memorymagic.com (2011) introduces Memory Magic as a “comprehensive, therapeutic program for people with a range of cognitive abilities.” The Memory Magic program was developed by Creative Action LLC. The Memory Magic program encourages Montessori principles through assistance from one player to another. The act of playing promotes social interaction and generates positive emotions. The program is in use at more than 1,000 facilities nationally and internationally.

Pictures of the game’s components and example questions are displayed in Appendices C, D, E and F. There are 16 games possible, with 15 questions for each game. The questions, answers, and discussion topics for nine of the games labeled with the word ALL are suitable for individuals with varying degrees of dementia. Three questions were randomly selected from each of the nine games. In addition, one of the nine games was randomly selected and 10 additional questions from that game were added to the test for a total of 37 gradable questions. Forty questions were on the test. The first three questions on the test were for practice and were not graded. See Appendix C for an example page from the test.

Intervention Application

After the participants had been consented, selected, level of dementia determined, and completed the pre-test, they were provided with the opportunity

to play the Memory Magic therapeutic program for 6 weeks at a rate of two game sessions per week. This is noted in step 4 of the research design in Figure 5. The research group met for approximately 30 minutes, twice a week, on the same days of the week and in the same location for a period of 6 weeks to participate in the playing of the Memory Magic program. The time of day alternated between mornings and afternoons.

The games were played in a specific order with Game 2 played more frequently. Thirteen of the written test questions were taken from Game 2. The study results included an analysis to determine if the higher frequency resulted in a greater percentage of correct answers on the mid-test and post-test for game 2. See Table 4 for the games' playing sequence.

The game-playing location for the intervention was within the confines of the memory unit, in its common area. The memory unit common area is approximately 150 feet by 60 feet and contains the dining area, an audio/visual area with couches and recliner chairs, and an activity area. Floor-to-ceiling partition walls provide noise abatement and visual privacy. Two 6-foot-by-3-foot tables allowed for five persons to sit on chairs or wheelchairs on either side of the tables. Cameras attached to tripods were positioned at the ends of the tables during the games playing times. The game-playing location can be seen in Figure 6.

Table 4. Calendar plan for the study

| Activity | Date | Time of Day |
|--------------|-----------------|---------------------------------|
| Pre-Tests | May 1, 3 | Morning |
| Play Game 1 | May 8 | Morning |
| Play Game 2 | May 10 | Morning |
| Play Game 5 | May 14 | Afternoon |
| Play Game 10 | May 16 | Morning |
| Play Game 2 | May 22 | Afternoon |
| Play Game 8 | May 24 | Morning |
| Play Game 15 | May 29 | Afternoon |
| Play Game 12 | May 31 | Morning |
| Play Game 2 | June 5 | Afternoon |
| Play Game 9 | June 7 | Morning |
| Play Game 11 | June 12 | Afternoon |
| Play Game 1 | June 14 | Morning |
| Mid-Tests | June 15, 16, 18 | Morning and Afternoon all dates |
| Play Game 2 | June 19 | Afternoon |
| Play Game 5 | June 21 | Morning |
| Play Game 10 | June 26 | Afternoon |
| Play Game 8 | June 28 | Morning |
| Play Game 2 | July 3 | Afternoon |
| Play Game 15 | July 5 | Morning |
| Play Game 12 | July 10 | Afternoon |
| Play Game 9 | July 12 | Morning |
| Play Game 2 | July 16 | Morning |
| Play Game 11 | July 19 | Morning |
| Play Game 1 | July 24 | Afternoon |
| Play Game 2 | July 26 | Morning |
| Post-Tests | July 27, 28, 30 | Morning and Afternoon all dates |



Figure 6. Game-playing location

The researcher provided the verbal information necessary for the participants to respond and the activity aide and researcher helped ensure the participants were closing the correct shutters. Occasionally, a nurse's aide would also intercede during the game playing. There was a pre-established rapport between the staff and the researcher, as he provided in-service presentations to the employees during the years of 2010 and 2011 and had conducted cognitive stimulation exercises with other residents beginning in 2006.

The calendar plan for the study (Table 4) identifies the days and times for the application of the game playing intervention. The researcher would arrive early, set up the cameras and ensure the correct game was loaded in the cardholder. As the ten participants arrived, the researcher would exchange pleasantries with them. The game-playing seating arrangement was random except for those that required more attention or assistance were placed such that the activity aide and/or the researcher could provide assistance with minimum interruptions to other players.

The intervention started with conversation designed to place the participants and the researcher at ease. A prayer would then be spoken by the researcher, followed by the Lord's Prayer. This was deemed appropriate, as the home is administered by a Christian church organization. Then the fun began with reading and showing the words on the first card. The group was encouraged to respond with the correct word. The researcher and activity aide provided assistance when necessary on closing or sometimes not closing the shutter. When a subject achieved a "bingo," the candy-and-cracker box was provided to him or her, and the subject would select one item from it. The typical intervention game playing time was 25 minutes.

The researcher directed the playing of the game, provided guidance to the subjects, and the activity director assisted the researcher by providing guidance to the participants as necessary. This guidance includes the assisting and prompting for lowering the shade.

The intervention sessions were videotaped. Two cameras were positioned to capture the participants from each end of the table. The behavior observations throughout the application of the intervention were captured on videotape and later reviewed for game-playing behaviors.

Mid-test and post-test

After the 12 sessions, a mid-test consisting of the same questions as the pre-test was administered. This is step 5 in Figure 5. The playing of the game continued for another 6 weeks at a rate of two per week.

After a total of 12 weeks (i.e., 24 sessions), the same test was administered as a post-test and the results compared with the mid-test and pre-test data.

Scoring

Scoring included the three tests; pre, mid and post, and the game-playing behaviors. The game question pre-test, mid-test, and post-test incorporated four gradients of difficulty to enhance sensitivity to increases in learning. Gradient 1 is to have the participant provide the correct answer. For example: A watched pot never _____. If the participant was unable to state the answer, they were shown a sheet with nine words in a 3x3 matrix and asked to circle the correct answer. This is gradient level 2. An example of the matrix is shown in Appendix D. If the participant was unable to select the correct word, they were given up to two words that rhyme with the correct answer and asked to state the answer shown on the 3x3 matrix. This is gradient level 3. If this was not accomplished, the participant was shown the correct answer on the 3x3 matrix and asked to state the word. Not being able to state the word resulted in a score of zero for the question.

The researcher observed the videos of playing the game and the data collected were placed in a table to display the quantity and recorded times associated with the learned behaviors. The seven behaviors of interest are:

1. verbally providing the correct answer
2. lowering the correct shade prior to the answer being stated
3. lowering the correct shade after the answer is known
4. requiring prompting in lowering the correct shade

5. requiring assistance in lowering the correct shade
6. providing assistance to another player
7. participating in the discussion

The table for entering the data is shown in Appendix L. Behaviors 1-7 (above) are shown in the left column of the table. The record time cells contain the record time at which a behavior was observed. There are 15 questions per game; hence, there are 15 recorded time columns.

For example, during a pilot game session, a participant required prompting for lowering the shade 5 times and required assistance in lowering the shade 3 times. Prompting for lowering the shade means the researcher or activity aide pointed out to the participant where the correct word was located on the board and that the shade should be lowered and then was lowered by the participant. The required assistance in lowering the shade means the researcher or activity aide had to physically assist the subject to demonstrate how to lower the shade. This was applied by the assistant placing the subject's hand on the shade and then the assistant placing her hand over the subject's, and together pulling the shade down. The required prompting for lowering the shade occurred at video recording times of 7:39, 10:17, 13:31, 14:05, and 15:40. The required assistance occurred at times of 3:30, 3:55, and 12:02. The other five behaviors for this game session did not occur.

The viewing of the videos for individuals' behaviors occurred for each session and the researcher focused on one individual each time the video was

played resulting in viewing the video the number of times equal to the number of participants. Experience has shown that it is possible to playback at twice the normal speed and still be able to observe behaviors and understand speech.

Data Analysis

The data for analysis were the MMSE scores, FLCI scores, pre-test, mid-test and post-test scores from the 37 game questions and the observed behaviors. Demographic data was retrieved from medical records. The test data were placed in a table. The test score consisted of the sum of points for all 37 questions. The score for an individual question could have a value of 1, .75, .5, .25, or 0.

A repeated measures analysis of variance (ANOVA) was used to determine the significance of any differences in the 37 game questions pre, mid, and post test scores for the participants. The level of statistical significance is $p < .05$. This level results in a 5% chance that the null hypothesis would be rejected even though even though it was true. This is referred to as a Type I error. A Type II error occurs when the null hypothesis is accepted but should have been rejected.

The data reported in the Observation table (see Appendix M) can be used to determine the frequency of a subject's specific behavior. For example, the data in the table indicates "required assistance on lowering the shade" occurred three times, and "prompting for lowering the shade" occurred 5 times.

The data can also be analyzed in determining if and when a behavior has been manifested. Subject 10 became capable of behavior 4 "closing the shade after

prompting” at 7:39 and then regressed back to “required assistance” at 12:02 and then returned to behavior 4 for three iterations (see Appendix M).

The 24 sessions provided plenty of opportunities for the subject to show improvement in the quantity of different behaviors, the quantity of each behavior, and the record time(s) at which the behavior(s) occurred. Performing the behavior demonstrated cognitive and psychosocial participation in the playing of the game. The subject had the knowledge and desire in spite of the physical damage caused by dementia.

Experimental group descriptive statistics such as the mean, median, range, and standard deviation were determined and reported. Demographic data pertaining to the experimental group have also been presented. This included the initial scores for the MMSE and FLCI. The scores may be used to determine the level of dementia for each participant. The levels are: mild, moderate, moderately severe, severe, and very severe. The data may be used to determine the correlation if any, between the level of dementia, and the increase/decrease in test scores and the observed game playing behaviors.

Limitations

A within-subjects, pre-test, post-test, experimental design threatens the internal validity; that is to the experiment itself. Fraental and Wallen (2008) suggest possible threats are: an insufficient number of baseline data points, interference from other similar activities throughout the experimental period of 12

weeks, and data collector bias. Gall et al. (2003) list maturation, statistical regression, and experimental mortality as possible threats to this experiment.

Number of Baseline Points

Fraenkel and Wallen (2008) suggested that three baseline points be collected prior to the planned intervention. The baseline point for this study is the score obtained on the pre-test. If the test was administered three times prior to the intervention, at a rate of once per week, the possibility of test learning may exist and taking the test could be construed as mental stimulation. This study relied on the results of the pre-test one week prior to commencement of the intervention, and the mid-test and post-test as measurement points during and after the intervention.

The purpose of obtaining baseline points prior to an intervention was to determine and identify if there are currently other influences on the dependent variable. This is especially salient in a longitudinal study in which individuals have a progressive disease such as dementia of the Alzheimer's type (DAT). However, the possibility of a sharp decline within this 14-week study was not likely. Reisberg (1997) has determined that the duration of mild dementia progressing to moderate dementia is 24 months and that moderate dementia progressing to moderately severe dementia is 18 months for persons with dementia of the Alzheimer's type (DAT). It is necessary though to take into account the possibility that a person may suffer a stroke that affects cognitive functions.

Interference from Similar Activities

Activities such as sing-alongs, bouncing the ball, crafts, puzzle assembly, and trivia are scheduled on a monthly activity calendar and attended by the residents. This is the normal routine and the Memory Magic game played twice a week is not. The normal routine was still in place throughout the 12-week intervention period.

Data Collector Bias

The pre-assessment, intervention, mid-assessment, intervention, and post-assessment were be administered by the researcher. It is possible that the researcher may have inadvertently applied a bias in the administration of the assessments as the researcher may have had a desire to demonstrate an increase in the participants' knowledge. To help mitigate this and to validate the data collection process, the pre, mid, and post assessment activities were audio recorded and the application of the intervention was videotaped.

Maturation

During the 12 weeks of intervention, a resident may have become ill and/or had a change in medications. An illness such as a urinary tract infection (UTI) can result in delirium (American Psychiatric Association, 2013). Delirium is defined as an acute mental disturbance characterized by confused thinking and disrupted attention usually accompanied by disordered speech and hallucinations. If the UTI occurred at any point during the 14 weeks, it could discredit the pre-, mid-, post- and intervention effects for the participant. A participant may also have had a

change in medication during the study period. Fortunately, these situations are documented and can be noted if necessary, in the results of the assessments.

Statistical Regression

It was likely that a resident in a memory unit has a power of attorney (POA) and it was the POA who signed the consent form. The resident may have had negative feelings about participating and therefore the pre-test score may have been lower due to the resident's attitude and lack of effort to correctly answer the test questions. The resident's attitude pertaining to their participation may have improved throughout the 12 weeks of game playing and may strive to more correctly answer the mid-test and post-test questions. The scores indicate an increase in knowledge and therefore a positive effect from the intervention. This may be a false positive.

Experimental Mortality

During the research study time period, it was possible that a participant may have died, become ill and not able to attend the intervention, or decided to opt out. Although this does impact the number of participants, the effect on the remaining participants and their individualized assessment results should be minimal. The researcher realized that if a married couple was part of the experimental group and one spouse died, this would have affected the psychological self/emotion of the survivor.

Threats to External Validity

In addition to internal threats, there were threats to the external validity of the experimental, within subjects, research study. Will this same study conducted under similar conditions in other institutions demonstrate the same results?

Fraenkel and Wallen (2008) suggested that a within subjects study by design is weak in external validity. It is not feasible to take the results of one individual and project it onto the entire population of residents with mild to moderate dementia living under comparable conditions. This is true; however, additional studies in other locations could be conducted to help determine the external validity of the original study.

Gall et al. (2003) delved deeper into external validity by identifying two validity categories of population and ecological. The population validity is defined as “the extent to which the results of an experiment can be generalized from the sample that was studied to a specified larger group” (Gall et al., 2003, p. 374). A larger group can be limited to a target population of participants in other memory type units within a 5-mile radius.

The ecological validity is defined as “the extent to which the results of an experiment can be generalized from the set of environmental conditions created by the researcher to different environmental conditions” (Gall et al., 2003, p. 375). The trick here is to replicate the physical and social settings of the prior study in the new locations, which may not be possible. If it is necessary to use the same data collectors and staff then the ecological validity is considered low. It is possible to

train other data collectors in an effort to mimic the original study. If the results of several replicated studies are consistent, then one could begin to believe in the generalization of the intervention's effect on the dependent variable.

Reviews of the Mini-Mental State Exam (MMSE) and the Functional Linguistic Communication Inventory (FLCI)

The two cognitive instruments used to determine the current level of dementia prior to the study are the Mini-Mental State Exam (MMSE) and the Functional Linguistic Communication Inventory (FLCI). The following reviews of these instruments includes the determination of assessment sensitivity, specificity, concurrent validity, predictive criterion validity, construct validity, the results of longitudinal studies, and the effect of other variables.

Mini-Mental State Examination

The authors of the Mini-Mental State Examination were Folstein, Folstein, and McHugh (1975). The publisher of the instrument is Psychological Assessment Resources, Inc. Psychological Assessment Resources is located at 16204 N. Florida Avenue, Lutz, FL 33549-8119. The MMSE is a test whose purpose is to quantitatively determine if an individual is cognitively impaired or cognitively intact. The severity of the impairment can also be determined. A person's level of cognitive abilities can vary due to physical problems such as dementia, Parkinson's, strokes, encephalitis, tumors and trauma. A common cause of dementia is Alzheimer's disease. If a person receives a low score, the person will require additional clinical tests to help determine the cause for the impairment. The MMSE

test score can be used to predict a medical diagnosis of dementia such as probable Alzheimer's, but is not a substitute for other clinical tests. The test is also used to serially assess increases or decreases in a person's level of cognition.

The test is administered verbally. The administration time is typically 10 to 15 minutes, although the test is not timed. There are 11 questions designed to measure the construct of cognition. The questions address seven different domains of cognition: Orientation to time, orientation to place, registration of three words, attention and calculation, recall of three words, language, and visual construction. The test is graded immediately. A person can achieve a maximum score of 30 points. A score below 24 is generally accepted as the cutoff point between cognitively impaired and cognitively intact and could be considered the point of dichotomy.

The MMSE is an instrument given for the purpose of quantitatively assessing the severity of cognitive impairment and documenting changes in cognition over time. How valid are the interpretations of the MMSE test results? Is the score a person receives indicative of their level of cognition? Can the proper decisions be made from the score? Can the score be used to predict future loss of cognition? Can the score indicate the reason for a decreased level of cognition? Can a pre-test score followed by higher post-test score following an intervention be used to indicate that the intervention was responsible for the change? Can the results be used to track the progression of dementia? To answer these questions, evidence needs to be obtained that demonstrates the validity of test score results and

interpretation. Analyzing the test content to determine if it measures all the dimensions and domains of cognition and by determining if the test score is affected by other variables can provide this evidence. This process includes the determination of assessment sensitivity, specificity, concurrent validity, predictive criterion validity, construct validity, the results of longitudinal studies, and the effect of other variables.

MMSE reviews. The evidence for validity is normally contained in reviews of an assessment instrument and the authors' original published documentation.

There are two reviews of the MMSE in the *Mental Measurements Yearbook (MMY)*. One review is by Albanese (2001); the other review is by Ward (2001). These reviews in the *MMY* also reference a review titled "The Mini-Mental State Examination: A Comprehensive Review," published in the *Journal of the American Geriatrics Society* (Tombaugh & McIntyre, 1992). The authors of the MMSE published their original article "A Practical Method for Grading the Cognitive State of Patients for the Clinician" in the *Journal of Psychiatric Research* (Folstein, Folstein, & McHugh, 1975). Additional validity information is contained in an article titled Population-Based Norms for the Mini-Mental State Examination by Age and Educational Level (Crum, Anthony, Bassett, & Folstein, 1993). Information from these reviews pertaining to sensitivity, concurrent validity, specificity, predictive criterion validity, construct validity, the results of longitudinal studies and the effect of other variables will be presented in the next few paragraphs.

Sensitivity. MMSE sensitivity was determined by comparing an achieved test score of 23 or below using subjects who were previously diagnosed with a medical condition affecting cognition. Sensitivity can be calculated as a percentage by dividing the true positives (scored 23 or lower) by the number of individuals tested. For example, if 80 people were previously diagnosed with a medical problem affecting cognition and 60 of them scored 23 or below, the sensitivity is 60/80 or 75%. The review of the MMSE by Albanese and the review by Ward in the *MMY* cite the 87% value obtained for sensitivity stated in Tombaugh and McIntyre's (1992) review. Although Albanese and Ward agree that 87% is impressive, they cast doubt upon the methods used to determine the value. Albanese and Ward want to know how the cutoff score of 23 was determined as the original authors never provided any data to substantiate the cutoff score.

To answer this, Tombaugh and McIntyre (1992) cited a study by Anthony, LaResche, Niaz, von Korff, and Folstein (1982) in which 99 patients previously diagnosed as cognitively impaired or cognitively intact were assessed using the MMSE. Twenty of the 23 cognitively impaired subjects (87%) were correctly identified by a score of 23 or below.

Concurrent validity. There is also a measure of concurrent validity. Concurrent validity looks at the relationship of test results and other results already available. An example is the relationship between an MMSE score and the prior determination that the person was cognitively impaired. The review by Tombaugh and McIntyre (1992) provided a list of approximately 25 other studies

that provide concurrent validity for the 23/24 cutoff score. A review of these studies may be used to determine their quality and applicability to validity evidence for sensitivity and concurrent validity. The true state of the subjects (cognitively impaired) was determined by the accepted criteria of DSM-III (Diagnostic and Statistical Manual of Mental Disorders).

Specificity. Another measure for assessment validity is specificity.

Specificity refers to the MMSE's ability to correctly identify individuals who have previously been determined to be cognitively intact. The percentage can be calculated by dividing the true negatives by the total number of those classified as cognitively intact. A list of approximately 25 studies that provide specificity values is shown in Table 2 of Tombaugh and McIntyre's (1992) review. These studies may need to be reviewed to determine their quality and applicability to validity evidence for specificity, even though the values listed are high.

Predictive criterion values. Another method of reporting validity is in terms of predictive criterion values. What is the likelihood that a person who scores 23 will be diagnosed with cognitive impairment? For the MMSE, the percentages were found to be at least 79%.

Construct validity. Another method used to obtain evidence for validity is by determining the construct validity. Construct validity is the extent to which an assessment operationalizes the concepts being studied. For the MMSE, the construct that needs to be operationalized is cognition. Construct validity evidence can be obtained by determining the degree to which the MMSE is correlated with

other tests measuring cognitive functioning. One reviewer in the *MMY* did not mention construct validity and the other reviewer states that no information was offered regarding evidence of construct validity. The review by Tombaugh and McIntyre (1992) does provide data indicating the MMSE when compared against Blessed Information-Memory-Concentration test correlated in the range of .66 to .93. Folstein et al. (1975) compared MMSE scores to those obtained on the Wechsler Adult Intelligence Scale. They found a correlation of .78 with the verbal scale and .66 with the performance scale. Evidence for construct validity was also obtained by comparing the MMSE to the Activities of Daily Living (ADL) measured with the Blessed Dementia Rating Scale (BDRS). The correlations were in the range of .40 to .75. The BDRS was originally validated against postmortem pathological studies that searched for plaque in the brain indicating dementia caused by Alzheimer's disease. The MMSE was also found to have a .70 correlation between test scores and plaque counts.

Longitudinal studies were also used to acquire additional evidence of construct validity. The review by Tombaugh and McIntyre (1992) cites longitudinal studies in which the MMSE was used to track the progression of Alzheimer's disease. Test-retest intervals of 1 month to 3 years showed a significant decline in MMSE scores.

Other variables. Other variables can confound the assessment's results. For example, studies cited by Tombaugh and McIntyre (1992) in their review of the MMSE showed that the variables of education, age, race, ethnicity and social class

affect a person's score on the MMSE. Gender was not found to affect the MMSE score. Crum, Anthony, Bassett, and Folstein conducted a study in 1993 for the purpose of identifying population-based norms for the mini-mental state examination by age and educational level. The reviewers in the study did not mention any of these other variables. Because the score can be affected by other variables, the predictive criterion validity of the cut-off score 23/24 can be in jeopardy. Crum et al. (1993) found that the mean score for a person 50-54 was 29, the mean score for 65-69 was 28, and the mean score for persons 80-84 was 26. A person with an education level of 5 to 8 years achieved a mean score of 26; while a bachelor's degree or higher had a mean score of 29. Tombaugh and McIntyre (1992) cited a study performed using 3000 English and Hispanic residents of Los Angeles test was given in both English and Spanish and analysis of individual items revealed that Hispanics performed significantly lower on many items.

In summary, the validity evidence presented in the reviews for the MMSE included assessment sensitivity, specificity, concurrent validity, predictive criterion validity, construct validity, the results of longitudinal studies, and the effect of other variables. The reviewers for *MMY* indicated more detail is required on how the validity evidence was obtained. The reviewers Tombaugh and McIntyre (1992) did a comprehensive review of the MMSE. They listed 169 reference sources. Their opinions of the validity evidence were that criterion validity measures show high levels of sensitivity for moderate to severe levels of dementia. They determined the evidence obtained from the construct validity studies demonstrate that the MMSE

scores correlate highly with those obtained from other types of cognitive screening tests. Longitudinal research with dementia patients illustrates the ability of the MMSE to serially document cognitive change.

Functional Linguistic Communication Inventory (FLCI)

The Functional Linguistic Communication Inventory (FLCI) assesses the domains of language and social communication (Bayles & Tomoeda, 1994).

Language and social communication includes reading, writing, sentence structure, gestures, picture identification, interpretation of signage, word association, introducing oneself, and verbally sharing information in an understandable and logical fashion. Language is a domain that continues to function into the later stages of dementia. Consequently, the FLCI is an instrument that can be used to determine cognitive levels for individuals with moderate to severe dementia. The administration time is approximately 30 minutes and requires no special training. The administrator does need to be familiar with the booklet, the questions to ask, a scoring sheet, and have in their possession a physical comb, pencil and mask.

The authors of the FLCI indicate the assessment results can be used to determine a person's level of dementia, provide information about levels of function, quantify the severity of deficits, and the assessment results can identify the communication methods that work well for an individual. The FLCI results can be used in the development of a care plan and to help educate family and caregivers.

FLCI Review. A search of the *MMY* reveals two reviews; one written by Camp and Brush (2009) and another written by Van Gorp (2009). Camp and Brush noted that the assessment authors used forty individuals with dementia of the Alzheimer's type (DAT) as a short-term sample and 91 DAT individuals in a 5-year longitudinal study to develop and standardize the instrument. The current level of dementia for the sample populations was determined through the use of a modified functional assessment stages (FAST) developed by Reisberg, Ferris, and Franssen (1985). Camp argued that with 40 test subjects, the number of them at each of the FAST last five stages is not a sufficient *n* and that no measures of internal consistency are given. The establishment of criterion validity was accomplished by testing 13 participants with the Arizona Battery for Communication Disorders instrument with a Pearson product-moment correlation of $r = .78$. Reliability for the FLCI was determined through retesting twenty of the forty participants after a 1-week wait. Within the 10 scored areas, the Pearson product-moment coefficients of determination ranged from .28 to .78 with three scored areas obtaining values greater than .7.

The review by Van Gorp (2009) indicated that the FLCI is an assessment instrument that contains test items with a level of difficulty suitable for persons with moderate to severe dementia. His main complaint is the small sample size (40) used to standardize the test with the modified FAST. In some areas, but not all, the standardized results also contained data from the cohorts in the longitudinal study group. This adds confusion and deprecates the validity of the instrument. The

reliability is also suspect due to using only 20 participants for retesting. The small sample size negatively affects the instrument's standardization, criterion validity and test re-test reliability.

Summary

Chapter III began with stating the research purpose, research questions, and hypotheses. The chapter also explained the research design with subheadings of sampling, demographics, pre-testing, intervention, intervention application, mid-test, post-test and scoring. The chapter continued with a discussion of data analysis. The study limitations were presented next, followed by reviews of the MMSE and FLCI cognitive assessments.

CHAPTER IV

RESEARCH RESULTS

Introduction

This chapter presents the results of the research described in Chapter III. Chapter IV will provide demographic information on the participants, descriptive statistics, the results of statistical tests and the outcomes in the framework provided by the hypotheses.

The research question was: Will adults with dementia living in long-term care increase their knowledge after the intervention of playing a game program within a socially interactive environment as measured by:

1. the MMSE scores administered as a pre-test, mid-test, and post-test?
2. the FLCI scores administered as a pre-test, mid-test, and post-test?
3. accumulative score of the number of correct answers to questions at the beginning, in the middle, and at the end of the intervention?
4. the comparison of scores for games 1, 5, 8, 9, 10, 11, 12, 15 against game 2?

There were four corresponding hypotheses:

1. The MMSE scores will significantly increase from pre-test, mid-test, and post-test.

2. The FLCI scores will significantly increase from pre-test, mid-test, and post-test.

3. The participant's knowledge of the board game's answers will significantly increase from beginning to the middle and towards the end of the game intervention.

4. The comparison of increasing scores for games 1, 5, 8, 9, 10, 11, 12, 15 against game 2 will be significantly less.

Also, it is anticipated that the number of positive game-playing behaviors would increase and negative behaviors would decrease. This was presented as descriptive data.

A key aspect of this research project was to determine if people with dementia could "learn" the answers to questions posed in a social environment. During the 12 contiguous week research period, 8 to 10 adults afflicted with dementia played 24 games; 2 per week. There were nine different games. All of the games were played at least twice.

A convenience sample of 10 subjects was recruited from within a memory unit at a long-term care center. Letters of consent and HIPAA authorization forms were signed by the subjects' powers of attorney. There were nine women and one man. Their ages ranged from 72 to 95 years old. Demographic data for the participants is shown in Table 5.

Table 5. Demographic Data of Study Participants

| Subject | Gender | Age | Diagnosis |
|------------|--------|-----|-------------------------------|
| Subject 1 | Female | 85 | Dementia |
| Subject 2 | Female | 82 | Alzheimer's / Senile Dementia |
| Subject 3 | Female | 82 | Alzheimer's Disease |
| Subject 4 | Female | 72 | Alzheimer's Disease |
| Subject 5 | Female | 86 | Alzheimer's Disease |
| Subject 6 | Female | 87 | Alzheimer's Disease |
| Subject 7 | Female | 81 | Alzheimer's Disease |
| Subject 8 | Female | 86 | Dementia |
| Subject 9 | Male | 95 | Alzheimer's / Senile Dementia |
| Subject 10 | Female | 95 | Dementia |

The research plan specified in Chapter III was executed as shown in Figure 7. The consented participants were assessed by the MMSE and FLCI prior to the intervention and twice more during the mid-test and post-test activities. The games were played in the order outlined in Table 4.

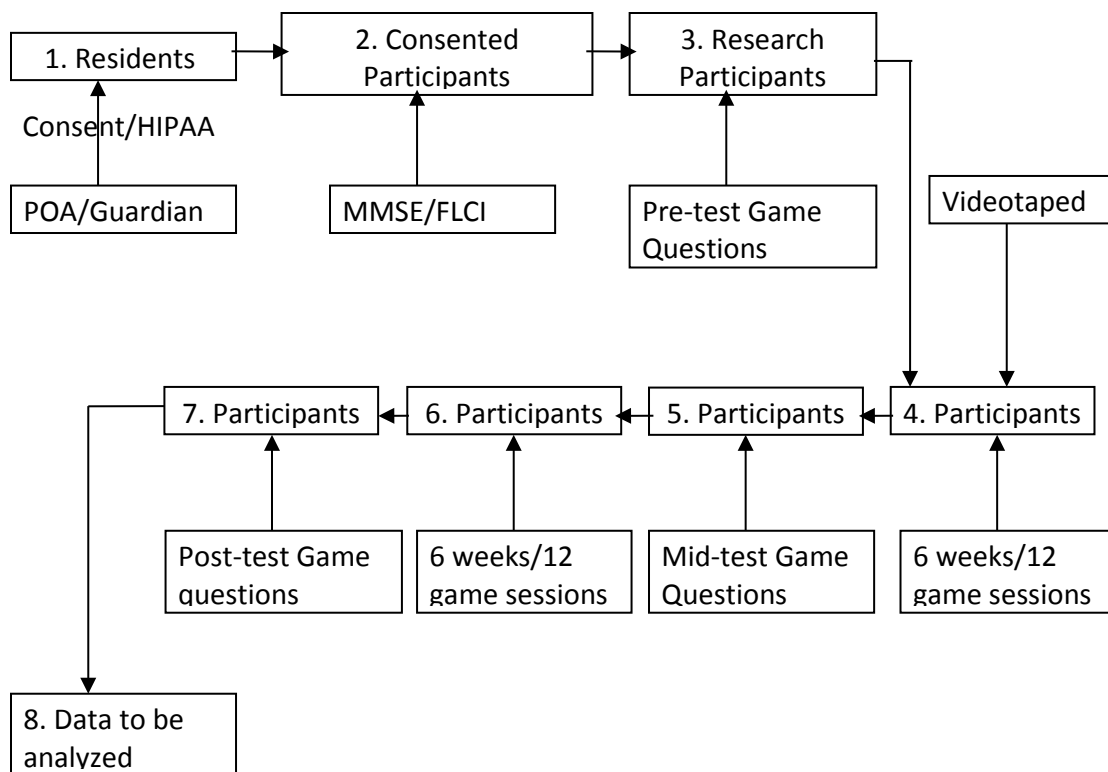


Figure 7. Research study design

Results of the MMSE Pre-Test, Mid-Test, and Post-Test

The MMSE scores for each participant and the averages per individual and the group are shown in Table 6. The planned number of participants was 10. Two participants did not complete the 12 weeks of intervention. The table provides the group's means and standard deviation.

Figure 8 plots the pre-test, mid-test, and post-test group averaged results, with a range of 1.63 points from the highest to the lowest. There was an increase in scores from pre-test to mid-test. There was a decrease from mid-test to post-test.

Table 6. Mini-Mental State Exam scores: Pre-test, mid-test, post-test

| Subjects | Pre-test | Mid-test | Post-test | Average |
|----------------------|-------------------|----------------|----------------|---------|
| Subject 1 | 20.00 | 21.00 | 18.00 | 19.67 |
| Subject 2 | 17.00 | 19.00 | 18.00 | 18.00 |
| Subject 3 | 17.00 | 18.00 | 12.00 | 15.67 |
| Subject 4 | 4.00 | 7.00 | X ³ | 5.50 |
| Subject 5 | 8.00 | 13.00 | 8.00 | 9.67 |
| Subject 6 | 0.00 ¹ | 1.00 | 5.00 | 6.00 |
| Subject 7 | 15.00 | X ² | X | X |
| Subject 8 | 13.00 | 13.00 | 10.00 | 12.00 |
| Subject 9 | 17.00 | 16.00 | 20.00 | 17.67 |
| Subject 10 | 1.00 | 5.00 | 6.00 | 4.00 |
| Average | 11.20 | 12.55 | 12.13 | |
| Average ⁴ | 11.62 | 13.25 | 12.13 | |
| Standard Deviation | 7.75 | 6.99 | 5.87 | |

Note. ¹ The zero for subject 6 was the actual score.

² Subject 7 was transferred from the study and was not administered the mid and post MMSE.

³ Subject 4 was transferred and was not administered the post MMSE.

⁴ The averages without subjects 4 and 7.

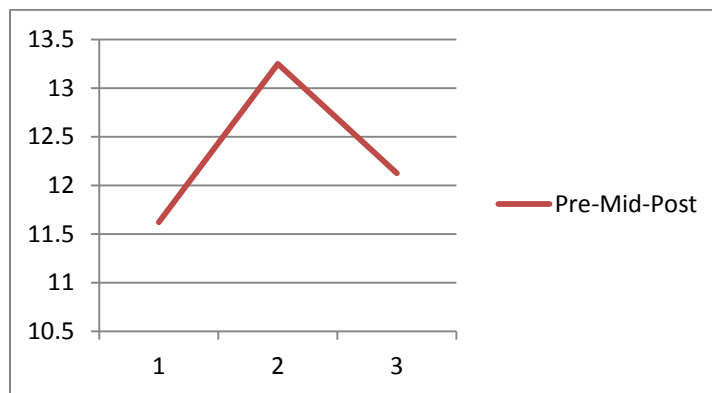


Figure 8. Average pre-test, mid-test, and post-test results for MMSE

The within-subjects repeated measure factors were: the measure, time, and score results. The measure was the MMSE instrument, time was the independent variable, and the dependent variables were the pre-test, mid-test, and post-test scores. The next few pages present the results of the statistical analysis used to determine significance.

It is necessary to determine if the distribution of the MMSE scores shown in Table 6 approximates a bell shaped normal curve. The Sharpiro-Wilk test of normality was used. The significance values were .111 for the pre-test, .316 for the mid-test, and .298 for post-test. A significance of $p > .05$ indicates the distribution does approximate a bell shaped normal curve. See Table P1 in Appendix P for the test of normality results.

Another statistical test is “Mauchly’s Test of Sphericity.” This test determines whether the variances of the differences between related groups (each subject is a group of 1) are equal. The results are shown in Table P2, Appendix P. The results do not display a significance level less than .05; therefore, the variances between all groups is equal.

The results of the ANOVA statistical test are shown in Table 7. The significance (Sig.) level was .384 indicating that the dependent variable (MMSE scores) was not statistically affected by the intervention applied over time.

Table 7. Tests of within-subject effects for the MMSE dependent variable

| | Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|-------|-----------------------|----------------------------|----|----------------|-------|------|------------------------|
| Time | Sphericity Assumed | 11.083 | 2 | 5.542 | 1.026 | .384 | .128 |
| Error | Sphericity Assumed | 75.583 | 14 | 5.399 | | | |

Note. The test of within-subjects effects for the MMSE measure reveals a calculated significance level of .384. The null hypothesis is accepted. ($p > .05$) Playing the Memory Magic game did not create a significant increase in MMSE scores, $F(2,14) = 1.026$, $p = .384$

Results of the FLCI Pre-Test, Mid-Test, and Post-Test

The FLCI was also administered as a pre-test, mid-test and post-test. Table 8 contains descriptive statistics for the FLCI. The FLCI scores for each participant, the averages per individual and the group, and the standard deviation are shown below.

Figure 9 provides a visual look at the meteoric rise of scores from pre-test to mid-test, following with a less dramatic rise from mid-test to post-test. The FLCI scores improved over the 12-week research period. The alternate hypothesis stated the FLCI scores will increase significantly from pre-test, mid-test, and post-test. It is necessary to conduct some additional tests to determine significance. The tests are Test of Normality, Mauchly's Test of Sphericity, and the Tests of Within-Subjects Effects.

Table 8. FLCI scores pre-test, mid-test, post-test

| Subjects | Pre-test | Mid-test | Post-test | Average |
|----------------------|----------|----------|-----------|---------|
| Subject 1 | 70.00 | 80.00 | 84.00 | 84.00 |
| Subject 2 | 75.00 | 83.00 | 75.00 | 75.00 |
| Subject 3 | 79.00 | 85.00 | 85.00 | 15.67 |
| Subject 4 | 62.00 | 41.00 | 0.00 | 5.50 |
| Subject 5 | 18.00 | 29.00 | 26.00 | 9.67 |
| Subject 6 | 5.00 | 18.00 | 19.00 | 6.00 |
| Subject 7 | 68.00 | X | X | X |
| Subject 8 | 69.00 | 70.00 | 70.00 | 69.60 |
| Subject 9 | 68.00 | 65.00 | 79.00 | 17.67 |
| Subject 10 | 43.00 | 37.00 | 34.00 | 4.00 |
| Average | 56.00 | 56.00 | 52.00 | |
| Average ¹ | 53.40 | 58.40 | 59.00 | |
| Standard Deviation | 28.18 | 26.49 | 27.54 | |

Note. ¹Averages without Subjects 4 and 7. Subject 7 was dropped from the study and was not administered the mid- and post-FLCI. Subject 4 was dropped from the study and was not administered the post FLCI

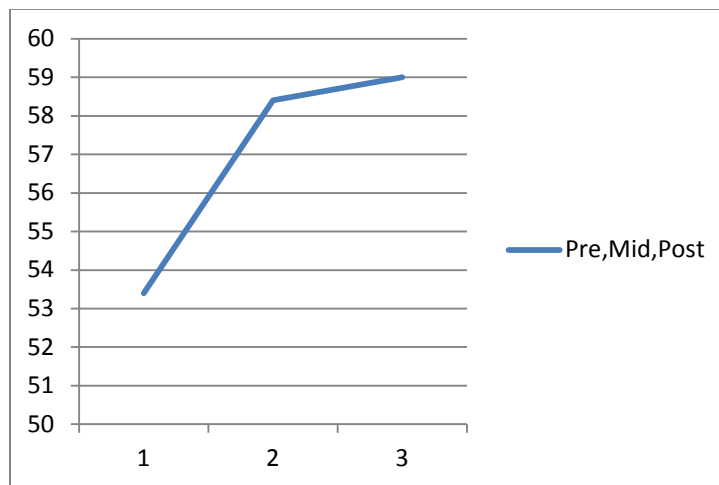


Figure 9. Average of FLCI scores

The Test of Normality results may be viewed in Appendix Q, Table Q1. A significance of less than .05 ($p < .05$) indicates the data was not normally distributed. Indeed, the pre-test and post-test values were not normally distributed. There is a significance of .049 for the pre-test and a .045 for the post-test. The choice of continuing with the repeated measures ANOVA was selected.

The repeated measures ANOVA results included the Mauchly's Test of Sphericity and the Tests of Within-Subjects Effects. The sphericity test detailed results can be viewed in Appendix Q, Table Q2. The significance level was greater than .05 indicating that the variances of the differences are equal. The within subject's effects results, displayed in Table 9, provided a significance level of .08 which is not significant. There was no significant growth from pre-test to post-test.

Table 9. Tests of Within-Subjects Effects

| Source | Type III of Squares | Sum Square | df | Mean | F | Sig. | Partial Eta Squared |
|--------------|------------------------|---------------|----|-------|------|------|------------------------|
| Time | Sphercity Assumed | 152.03 | 2 | 76.04 | 2.99 | .08 | .30 |
| Error(times) | Sphercity | 356.58 | 13 | 27.06 | | | |

Note. The significance value of .083 is not significant ($p > .05$). There is no significant growth for the dependent variable from pre-test to post-test.

Results for Number of Correct Responses

The researcher's next null hypothesis statement was that there will be a statistically significant increase from the pre-test, mid-test and post-test scores on the 40-question test. The dependent variable for the hypothesis was the number of correct responses to the information provided by the Memory Magic therapeutic game. The change in knowledge has been measured by the number of correct answers to the questions asked during the interventions with the Memory Magic game.

The descriptive data for the 40-question test scores is shown in Table 10. The averages are plotted in Figure 10. The graph illuminates a greater rate of learning from pre-test to mid-test and a lesser degree of learning during the latter 6 weeks.

Table 10. Forty-Question Test Scores Pre-test, Mid-test, Post-test

| Subjects | Pre-test | Mid-test | Post-test | Average |
|----------------------|----------|----------|-----------|---------|
| Subject 1 | 26.00 | 32.00 | 33.75 | 30.60 |
| Subject 2 | 33.25 | 35.75 | 36.00 | 35.00 |
| Subject 3 | 28.00 | 33.50 | 31.75 | 31.00 |
| Subject 4 | 15.00 | 18.75 | X | 16.90 |
| Subject 5 | 15.00 | 19.25 | 20.25 | 18.20 |
| Subject 6 | 2.00 | 6.25 | 11.75 | 6.70 |
| Subject 7 | 29.75 | X | X | X |
| Subject 8 | 29.75 | 29.00 | 30.50 | 29.75 |
| Subject 9 | 19.00 | 32.25 | 31.75 | 27.67 |
| Subject 10 | 3.00 | 22.75 | 22.50 | 16.10 |
| Average | 20.00 | 25.72 | 27.28 | |
| Average ¹ | 19.50 | 26.34 | 27.28 | |
| Standard Deviation | 11.99 | 9.86 | 8.29 | |

Note. ¹ averages without subjects 4 and 7

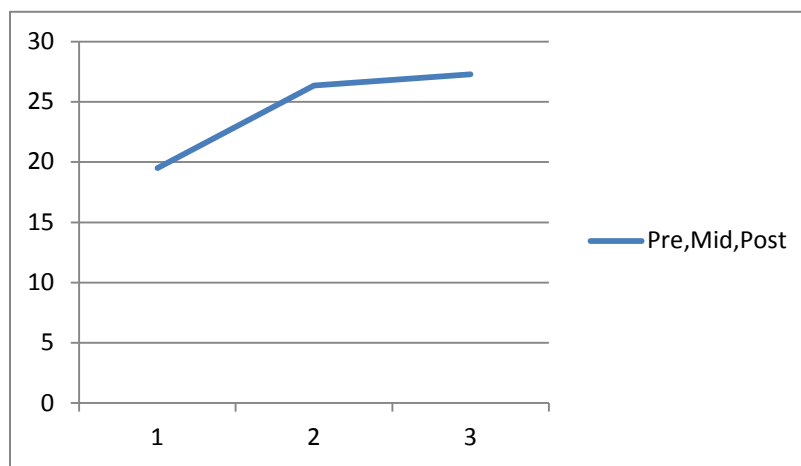


Figure 10. Averages of forty-question test scores

Table 10 provides the 8-member-group score means and standard deviation from the pre-test, mid-test, post-test scores. The standard deviation can be used to determine the range of scores when assuming a bell-shaped distribution. The two assumption endpoints are $19.50 - 11.99 = 7.51$ and $19.50 + 11.99 = 31.49$. The reality, though, was that the minimum and maximum scores were 2 and 33.25. The scores of 2 and 3 can be considered outliers. Outliers, if not mathematically compensated for, can result in a Type II error. Type II errors can result in a false acceptance of the null hypothesis. Test scores increased throughout the measured time beginning with an average of 19.50, followed by 26.34, and a further increase to 27.28. An increase is good; however, is it statistically significant. Additional mathematical analysis is required.

Illeris' three dimensions of learning are cognition, emotion, and environment. This research was designed to test for a statistically significant increase in knowledge cognition fostered by positive emotions and a social environment created by playing the Memory Magic therapeutic game. The knowledge (learning) results were indeed significant at a significance level of .01 ($p < .05$).

Further analysis of the data is required to substantiate the claim of significance. The dependent variables are the mean score for the group of eight obtained from the pre-test, mid-test and post-test scores. The researcher's within subjects' study is time based. Participants were measured three times designated as pre-test mid-test and post-test. The independent variable was the Memory Magic

game. This is a within-subjects repeated measures design. The dependent variables (scores) are classified as intervals on a continuous scale. For example, a subject may have scores of 21, 19.5 and 28.6. A repeated measures ANOVA (analysis of variance) is the most appropriate statistical test. The ANOVA will determine if there are any statistically significant differences between the groups' mean scores at the time points of pre-test, mid-test, and post-tests. The groups are related as they contain the same participants at the time points of pre-test, mid-test and post-test. The results of the SPSS statistical tests will provide the mean and confidence levels for the pre-test, mid-test and post-tests, determine the level of confidence, and provide a measure of effect size.

Assumptions made are that there are no outliers; i.e., extreme low or high values compared to the rest of the group. Another assumption is that the group's data has a normal distribution as represented by a bell-shaped curve. A third assumption is that the variances of difference will be spherical. A sphere is perfectly round like a soccer ball. The next few pages will provide additional SSPS results using an ANOVA repeated measures within subjects.

The Test of Normality for the Forty Question Test Scores results is shown in Appendix R. The Shapiro-Wilk Test of Normality did not provide a level of significance less than .05. The score data obtained for the pre-test, mid-test and post-test is therefore normally distributed. An analysis of outliers such as the 2 and 3 found in the pre-test data provided evidence that indicates the absence of outlier effects.

Mauchly's Test of Sphericity was used to determine if the variances of differences is equal. The results can be viewed in Appendix R. The test of sphericity produced a significance value of .025 ($p < .05$) indicating that the differences are not equal. To compensate for that, a Greenhouse-Geisser correction was applied. The results are displayed in Appendix R, Table R1.

Table 11. Tests of within-subjects effects for the forty question test scores

| Times | Source | Type III Sum of Squares | df | Mean | F | Sig. Square | Partial ETA | Observed Power Squared |
|------------------|------------------------|-------------------------------|------|--------|-------|----------------|----------------|------------------------------|
| Times | Greenhouse- Geisser | 288.70 | 1.17 | 246.44 | 10.17 | .01 | .59 | .83 |
| Error (times) | Greenhouse- Geisser | 198.80 | 8.20 | 24.24 | | | | |

Note. Sphericity was violated as noted in Table 4.12 (Mauchly's Test of Sphericity) and the Greenhouse-Geisser correction was applied. With the correction applied, the significance level was calculated to be .01 ($p < .05$). The Partial Eta squared (.59) is a measure of effect size, i.e. time contributes 59 % of the increases in scores. Playing the Memory Magic game did provide statistically significant increases for the research subjects over time, $F(1.17, 8.20) = 10.12, p < .05$, partial Eta squared = .59.

Table 12. Tests of within-subjects contrasts forty question test scores

| Source Factor 1 | Type III Sum of Squares | df | Mean Square | F | Sig. |
|-------------------------|-------------------------|----|-------------|-------|------|
| Linear Factor 1 | 242.19 | 1 | 242.19 | 12.88 | .01 |
| Linear Error (factor 1) | 131.65 | 7 | 18.81 | | |

Note. The Factor1 result indicated the increase pattern significant at .01. There is a significant linear component ($p < .05$) for the data results from pre-test > mid-test > post-test.

Table 13. Tests of between-subjects effects forty question test scores

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|-----------|-------------------------|----|-------------|-------|------|---------------------|
| Intercept | 14259.38 | 1 | 14259.38 | 50.64 | .88 | |
| Error | 1971.13 | 7 | 281.59 | | | |

Note. The p value in the Sig. column is ($p < .0001$). The p value is less than the research study's .05 confidence level. Therefore, we fail to reject the null hypothesis. The variances in the group of participants are approximately equal.

Table 14. Pairwise comparisons forty questions test scores

| (I) Times | (J) times | Mean Difference (I-J) | Std. Error | Sig. |
|-----------|-----------|-----------------------|------------|------|
| 1 (pre) | 2 (mid) | -6.84 | 2.32 | .06 |
| 1 (pre) | 3 (post) | -7.81 | 2.17 | .03 |
| 2 (mid) | 3 (post) | -0.94 | 0.77 | .78 |

Note. The pairwise comparisons table provides results of the differences between the pre-test, mid-test, and post-test. The significant values ($p < .05$) indicate that the difference between the pre-test and post-test is significant.

Table 15. Effect size calculations

| |
|--|
| $27.28(\text{post-test mean}) - 19.50(\text{pre-test mean}) / (8.29 + 11.99) \times .5 = .767$ (effect size) |
| $26.34(\text{mid-test mean}) - 19.50(\text{pre-test mean}) / (9.86 + 11.99) \times .5 = .626$ (effect size) |
| $26.34(\text{mid-test mean}) - 27.28(\text{post-test mean}) / (9.86 + 8.29) \times .5 = .104$ (effect size) |

The majority of the game playing effect (time) on the dependent variable (scores) took place in the first six weeks of playing. The over-all effect size pre-test to post-test was .767.

Game 2 scores vs. Games 1, 5, 8, 9, 10, 11, 12, 15 scores

The researcher was also interested in determining if more correct answers (higher scores) would emerge if a game was more frequently played. Game 2 was

played seven times during the intervention. Games 5, 8, 9, 10, 11, 12, and 15 were played only twice. Game 1 was played three times. Figure 11 identifies the number of times each game was played.



Figure 11. *Number of times each game was played*

The hypothesis was that the game played more frequently, game 2, would garner a greater increase in the number of correct answers. The group averages for the pre-, mid- and post-game numbers are shown in Table 16.

There were increases from pre to post for all games, however, Game 2's increases do not appear significantly different from any of the other 8 games. The test for correlations between Games 1, 5, 8, 9, 10, 11, 12, 15 and 2 are shown in Table 17 and indicate a positive correlation. Using the intervention as the delivery vehicle for Game 2 played seven times may not have provided the intensity required for the participants to score higher compared to the correct answers for the other games.

Table 16. Group Averages for Pre-Test, Mid-Test, and Post-Test Numbers

| Game Number | Pre-Test | Mid-Test | Post-Test |
|-------------|-----------|-----------|-----------|
| Game 1 | 2.81 | 3.44 | 3.72 |
| Game 2 | 2.06 | 2.53 | 2.66 |
| Game 5 | 2.16 | 3.03 | 3.03 |
| Game 8 | 2.41 | 3.13 | 3.03 |
| Game 9 | 1.41 | 2.47 | 2.25 |
| Game 10 | 1.84 | 2.84 | 2.81 |
| Game 11 | 2.81 | 3.41 | 3.78 |
| Game 12 | 2.47 | 3.09 | 3.38 |
| Game 15 | 1.53 | 2.38 | 2.38 |
| Range | 1.41-2.81 | 2.38-3.44 | 2.25-3.78 |

Table 17. Correlations between games 1, 5, 8, 9, 10, 11, 12, 15 and game 2

| Game Number | Correlation to Game 2 |
|-------------|--------------------------|
| Game 1 | .995 |
| Game 5 | .978 |
| Game 8 | .997 |
| Game 9 | .919 |
| Game 10 | .973 |
| Game 11 | .984 |
| Game 12 | .994 |
| Game 15 | .978 |

The group averages for the games and the positive correlation data lends credence to the idea that perhaps the learning was due to an increased ability to retrieve information from long-term memory rather than creating new memories.

The hypothesis of “the comparison of increasing scores for games 1, 5, 8, 9, 10, 11, 12, and 15 against game 2 will be significantly less” failed to be true.

Game Playing Behaviors

The researcher was also curious if the number of positive game-playing behaviors would increase and negative behaviors would decrease. The following information provides a qualitative description of each subject and identifies the game-playing behaviors exhibited during the interventions. The game-playing behaviors monitored were:

Did the participant:

1. Verbally provide the correct answer
2. Lower the correct shade prior to the answer being stated
3. Lower the correct shade after the answer is known
4. Require prompting in lowering the correct shade
5. Require assistance in lowering the correct shade
6. Provide assistance to another player
7. Participate in the discussion

The behaviors of 2 thru 5 resulted in a shade closure. Each player had the possibility of closing 9 shades for each of the 24 games played (9 X 24), which is a total of 216 closures.

Subject 1

Subject 1 was relatively new (one year) to the memory unit facility. Her age was 86 years; psychiatric or psychological diagnosis is dementia, anxiety, and

depression. She requires assistance on all ADL's (Activities of Daily Living) except ambulating, requires assistance with use of telephone, and is dependent for the other IADL's (Instrumental Activities of Daily Living). The list of ADL's can be viewed in Appendix B. The list of IADL's is in Appendix H.

Subject 1 was outgoing, acted without conscience at times, repeated her stories, was quick to verbalize the game intervention answers, tended to close her neighbors' game board shades, and participated in discussions with little prompting. Her game-playing behaviors included the ability to say the correct answer after a phrase was spoken by the leader even when the word was not present on her card. She assisted other players a total of 14 times, verbally provided the correct answer 142 times, and frequently participated in the discussions. Figure 12 indicates the subject exhibited the behavior of lowering the correct shade after the answer is known. There are nine possible correct answers for every game.

This participant demonstrated the ability to locate and lower the correct nine shades during each game she played. The line graph is void of data for game 1, as she was absent from it. The mean from the 23 games played for the behaviors associated with closing the shade is 9.0, which equates to 100%. She had "bingo" for every game and never required prompting or assistance when playing the game. She also displayed the behavior of providing assistance to another player. This occurred in 9 of the 23 games played. Table 18 lists the behaviors and the number of times the behavior occurred.

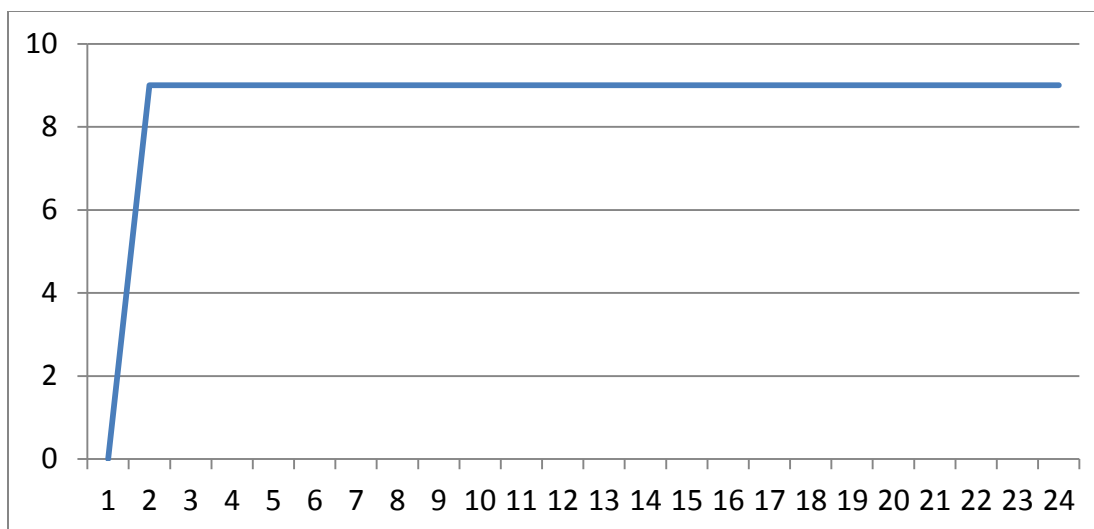


Figure 12. Subject 1's frequency of lowering a shade after an answer is known.

Note. The numbers on the left represents the number of closures. The maximum number of closures for each game is nine. The numbers at the bottom indicate there were 24 games.

Table 18. Frequency of Behavioral Occurrences for Subject 1

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 124 |
| Lowering the correct shade prior to the answer being stated | 0 |
| Lowering the correct shade after the answer is known | 207 |
| Requiring prompting in lowering the correct shade | 0 |
| Requiring assistance in lowering the correct shade | 0 |
| Providing assistance to another player | 14 |
| Participating in the discussion (number of games) | 23 |

Subject 2

Subject 2 started off slowly on her first game. She required prompting in closing the correct shade for each of her words. The line chart in Figure 12 provides a visual of her performance pertaining to closing the shade after the word was

known. For example the subject during game one did not once lower the correct shade on her own. Figure 13 demonstrates this by placing the line for game one at zero. This was not the case for the second game. She successfully lowered the correct shade without prompting nine times for a score of nine. A slide backwards occurred in the third game, as only five of the correct shades were closed after the word was stated.

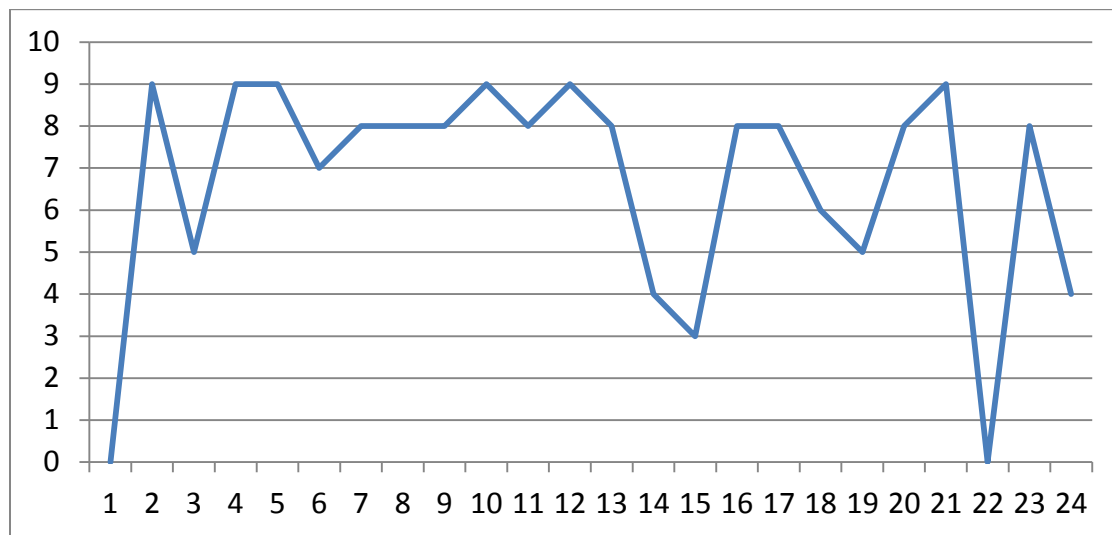


Figure 13. Subject 2's frequency of lowering a shade after an answer is known

Note. The numbers on the left represents the number of closures. The maximum number of closures for each game is nine. The numbers at the bottom indicate there were 24 games.

The most frequent game-playing behavior exhibited was lowering the correct shade after the answer is known. The mean from the 24 games for the behavior of “lowering the shade after the word was known” was 6.67 or 74.1 percent of the game-playing behaviors. Table 19 lists the behaviors for Subject 2 and the frequencies with which they occurred.

Table 19. Frequency of behavioral occurrences for subject 2

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 0 |
| Lowering the correct shade prior to the answer being stated | 2 |
| Lowering the correct shade after the answer is known | 160 |
| Requiring prompting in lowering the correct shade | 35 |
| Requiring assistance in lowering the correct shade | 1 |
| Providing assistance to another player | 0 |
| Participating in the discussion (number of games) | 1 |

Subject 2's ability to play the game by "lowering the correct shade after the answer is known" varied throughout the 24 games. Games 2, 4, 5, 10, 12, and 21 were the only games played in which the subject was successful in "lowering the correct shade after the answer is known" for all nine possible answers.

Subject 3

Subject 3 performed well playing the games. The subject was absent from Games 16, 22, and 24. She participated in discussions during four of the games played and verbally spoke the answers. The subject exhibited behavior three instances of "lowering the correct shade after the answer is known," 98% of the time when playing a game.

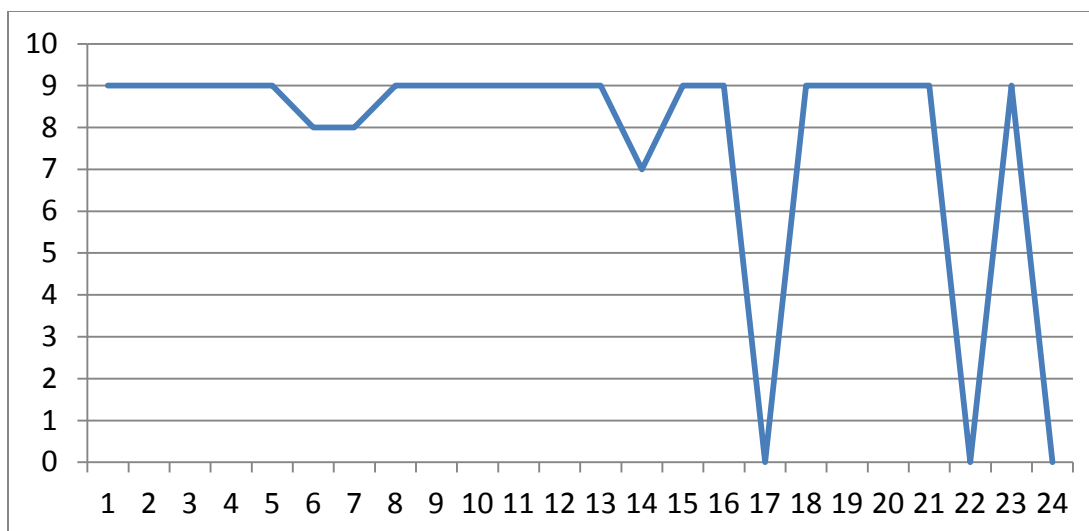


Figure 14. Subject 3's Frequency of Lowering the Correct Shade After the Answer is Known

Note. The numbers on the left represents the number of closures. The maximum number of closures for each game is nine. The numbers at the bottom indicate there were 24 games.

Table 20. Frequency of behavioral occurrences for subject 3

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 51 |
| Lowering the correct shade prior to the answer being stated | 2 |
| Lowering the correct shade after the answer is known | 185 |
| Requiring prompting in lowering the correct shade | 2 |
| Requiring assistance in lowering the correct shade | 0 |
| Providing assistance to another player | 2 |
| Participating in the discussion (number of games) | 3 |

Subject 5

Subject 5 attended all 24 game sessions. She required prompting and assistance in closing the shade. For example, the behavior of "lowering the correct

shade after being prompted” in the first game occurred once. The behavior of “lowering the correct shade with assistance” occurred eight times in the first game for a total of nine closures. The behavior of “lowering the correct shade after being prompted” in the 17th game occurred eight times and the behavior of “lowering the correct shade with assistance” occurred one time, for a total of nine closures. The behavior of “lowering the correct shade after being prompted” in the 23rd game occurred five times, and the behavior of “lowering the correct shade with assistance” occurred four times, for a total of nine closures. The subject only performed the behavior “lowering the correct shade after the answer is known” once out of the possible 216 closures. Subject 5’s game playing behaviors remained consistent throughout the 24 games. The behaviors for Subject 5 are summarized in Table 21.

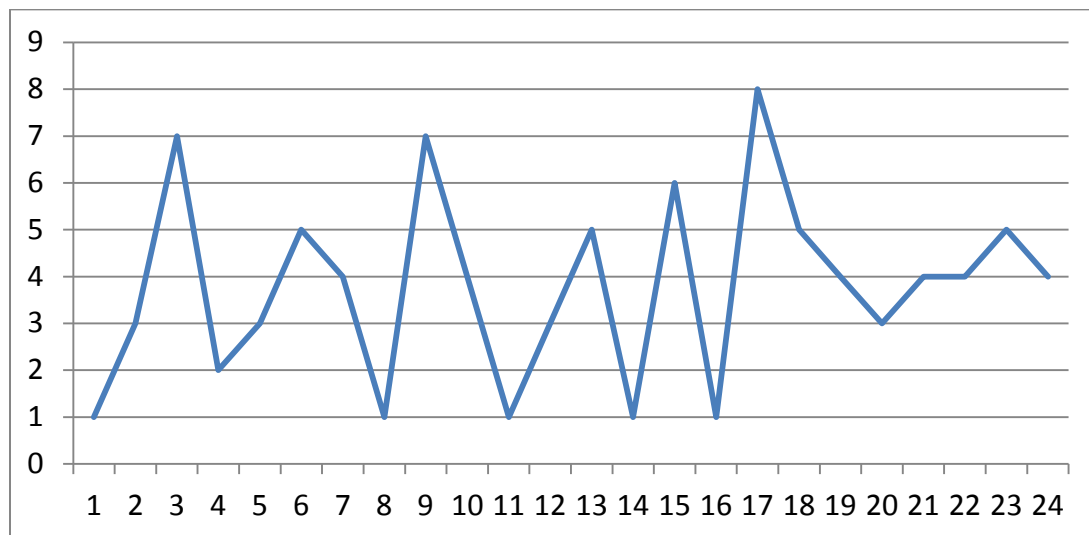


Figure 15. Subject 5’s frequency of lowering the correct shade after being prompted

Note. The numbers on the left represents the number of closures. The maximum number of closures for each game is nine. The numbers at the bottom indicate there were 24 games.

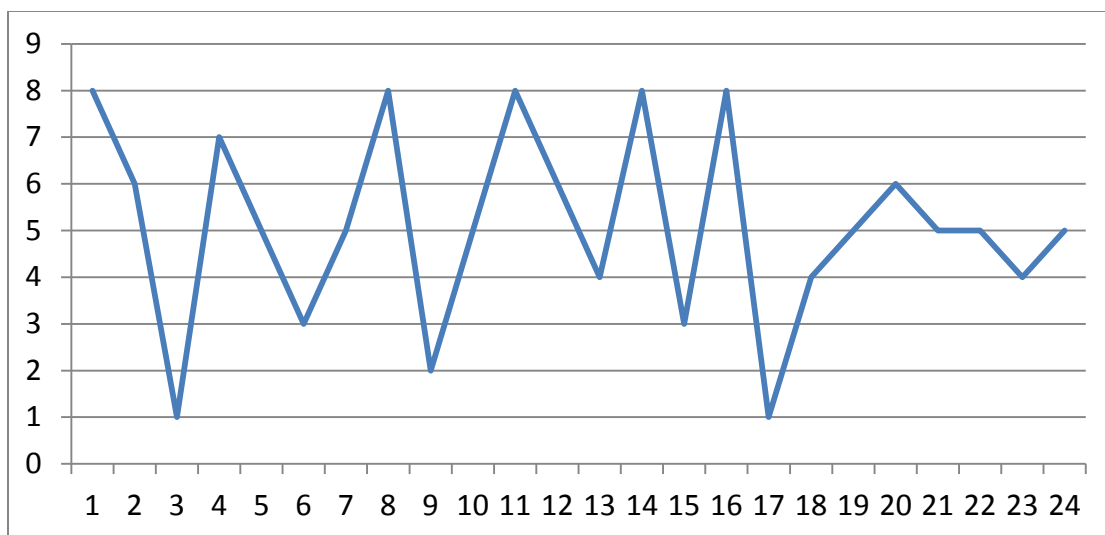


Figure 16. Subject 5's frequency of lowering the correct shade with assistance

Table 21. Frequency of behavioral occurrences for subject 5

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 22 |
| Lowering the correct shade prior to the answer being stated | 0 |
| Lowering the correct shade after the answer is known | 1 |
| Requiring prompting in lowering the correct shade | 91 |
| Requiring assistance in lowering the correct shade | 124 |
| Providing assistance to another player | 0 |
| Participating in the discussion (number of games) | 1 |

Subject 6

Subject 6 exhibited the behaviors of closing the shade after the word is known or having been prompted. The mean for the behavior "lowering the correct shade after the answer is known" is 3.14 equal to 35% of the behaviors. The mean for the behavior "requiring prompting in lowering the correct shade" is 4.76 equal

to 53% of the possible game-playing behaviors. Figure 17 demonstrates the subject's declining need for assistance after the seventh game. Figure 18 demonstrates the increasing need for prompting beginning with the 8th game followed by a decline of the behavior beginning with the 18th game. Figure 19 portrays the increase in her ability of "lowering the correct shade after the answer is known." Subject 6 did not attend game sessions 3, 15, and 20.

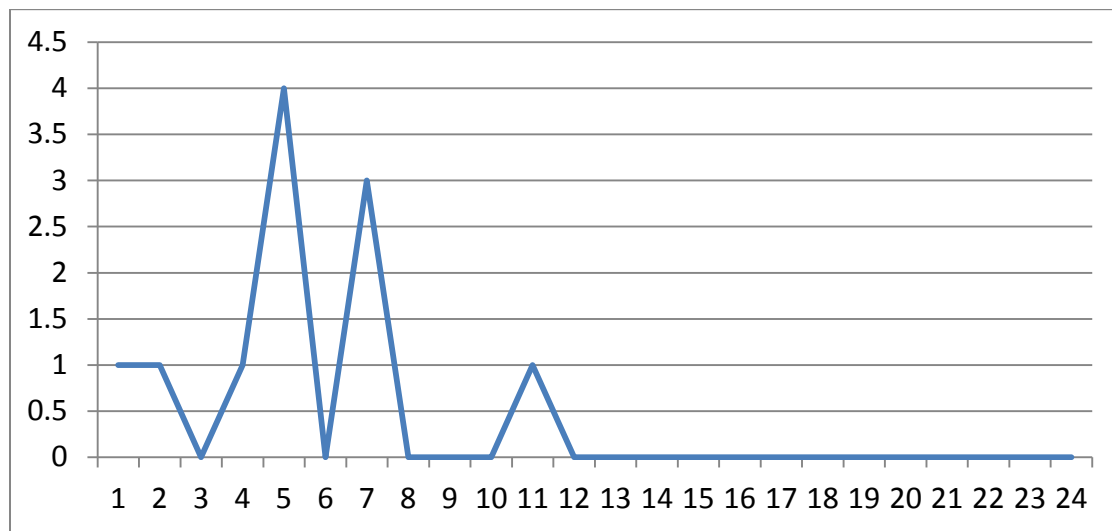


Figure 17. Subject 6's frequency of lowering the correct shade with assistance

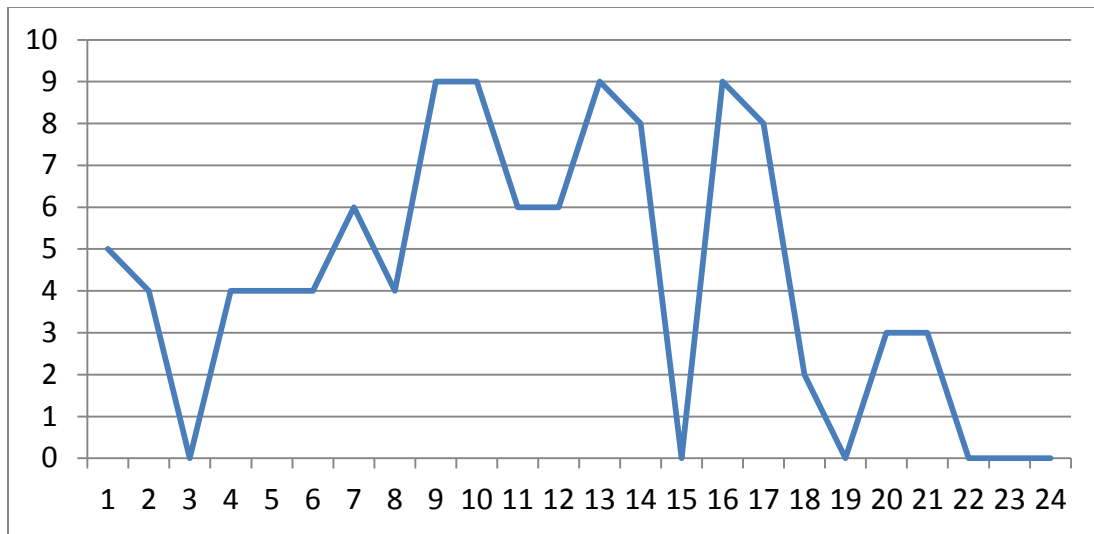


Figure 18. Subject 6's frequency of lowering the correct shade after being prompted

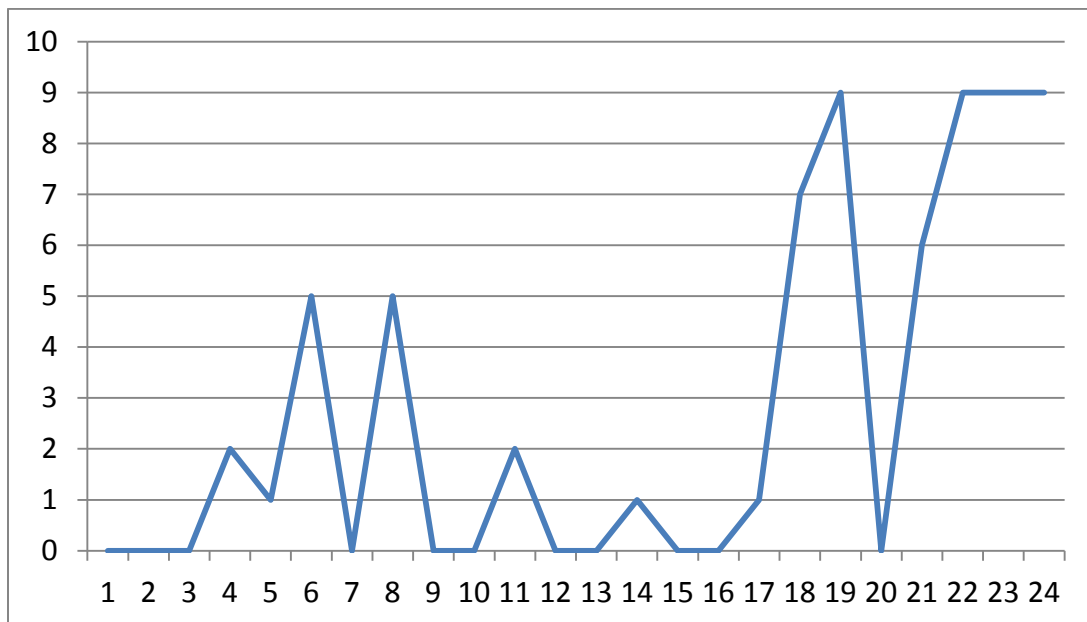


Figure 19. Subject 6's frequency of lowering the correct shade after the answer is known

Subject 6's negative behaviors of requiring prompting and requiring assistance declined throughout the 24 games. The positive behavior of "lowering the correct shade after the answer is known" increased. She did not attend Games 3,

15, and 20. There was some growth in the ability of the subject to lower the correct shade after the answer is known. This is manifested by the behavior increase in Games 22, 23, and 24. A summary of Subject 6's behaviors can be found in Table 22.

Table 22. Frequency of behavioral occurrences for subject 6

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 7 |
| Lowering the correct shade prior to the answer being stated | 0 |
| Lowering the correct shade after the answer is known | 66 |
| Requiring prompting in lowering the correct shade | 100 |
| Requiring assistance in lowering the correct shade | 1 |
| Providing assistance to another player | 1 |
| Participating in the discussion (number of games) | 0 |

Subject 8

Subject 8 exhibited the behaviors of "lowering the correct shade after the answer is known" and "requiring prompting in lowering the correct shade." Figure 20 provides a visual look at the number of times she correctly closed the shade for each game after the answer was known. Table 23 indicates the subject lowered the shade after the word was known 189 times out of the possible 216. The mean for closing the shade after the word is known was 7.54 equal to 83.8%. Table 23 shows the subject required prompting 33 times equal to 15%. Her ability to increase the behavior of "lowering the correct shade after the answer is known" was inconsistent.

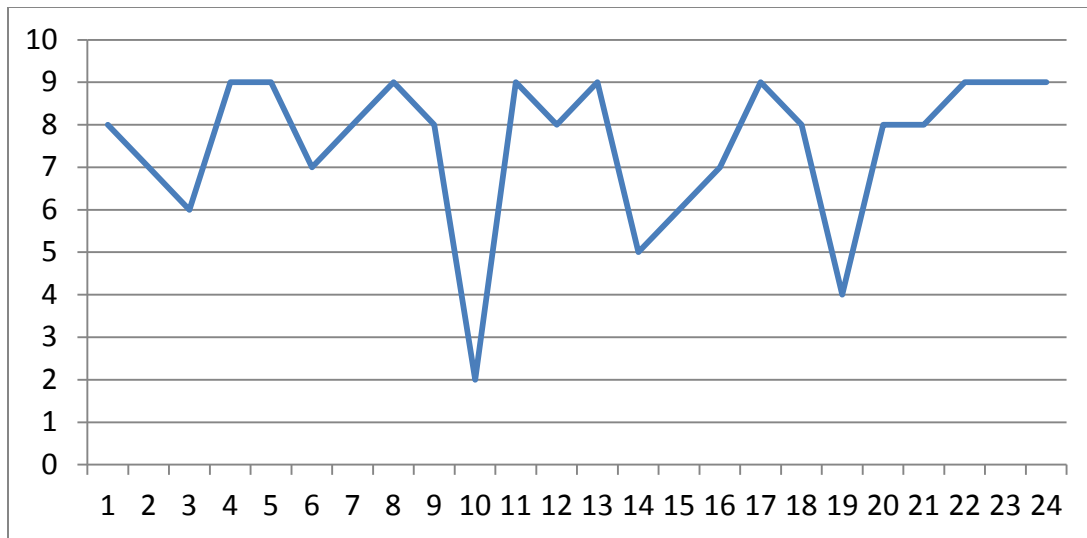


Figure 20. Subject 8's frequency of lowering the correct shade after the answer is known

Table 23. Frequency of behavioral occurrences for subject 8

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 0 |
| Lowering the correct shade prior to the answer being stated | 0 |
| Lowering the correct shade after the answer is known | 189 |
| Requiring prompting in lowering the correct shade | 33 |
| Requiring assistance in lowering the correct shade | 2 |
| Providing assistance to another player | 4 |
| Participating in the discussion (number of games) | 4 |

Subject 9

Subject 9 exhibited the behavior of “lowering the correct shade after the answer is known” a majority of the time. The mean for closing the shade after the answer is known is 8.78 equal to 97.5% of the possible game-playing behaviors.

The subject was absent for Game 15. The behaviors for Subject 9 are detailed in Table 24.

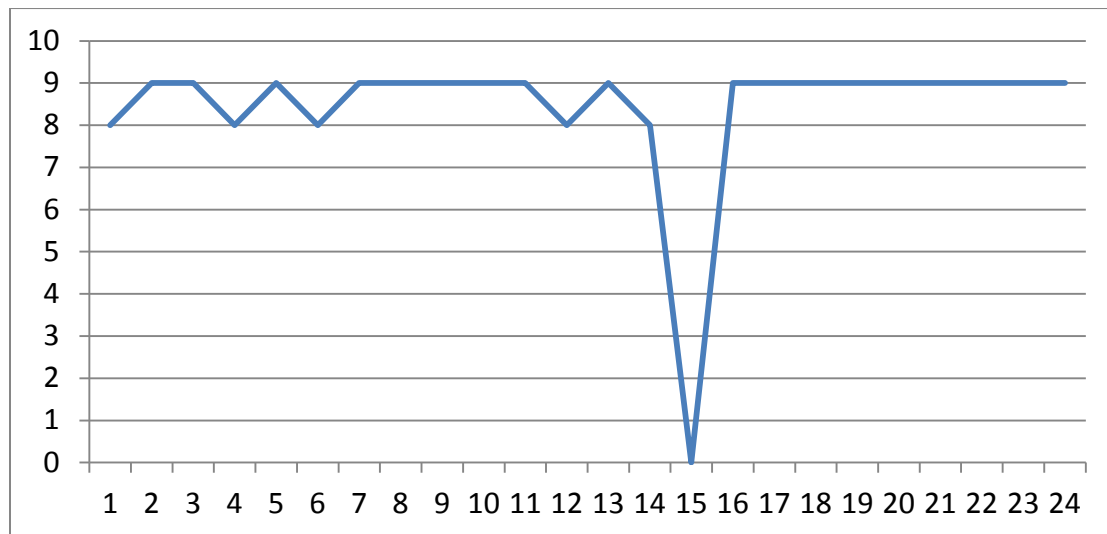


Figure 21. Subject 9's frequency of lowering the correct shade after the answer is known

Table 24. Frequency of behavioral occurrences for subject 9

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 75 |
| Lowering the correct shade prior to the answer being stated | 0 |
| Lowering the correct shade after the answer is known | 212 |
| Requiring prompting in lowering the correct shade | 3 |
| Requiring assistance in lowering the correct shade | 0 |
| Providing assistance to another player | 3 |
| Participating in the discussion (number of games) | 7 |

Subject 10

Subject 10 exhibited the behaviors of “lowering the correct shade after being prompted” and “lowering the correct shade with assistance.” The mean for

requiring prompting is 7.54 equal to 83.8%, and the mean for assistance is .71, equal to 8% of the game-playing behaviors. Figure 22 indicates the subject increased her ability to close the shade with prompting and a corresponding decrease of requiring assistance. The behaviors for subject 10 are summarized in Table 25.

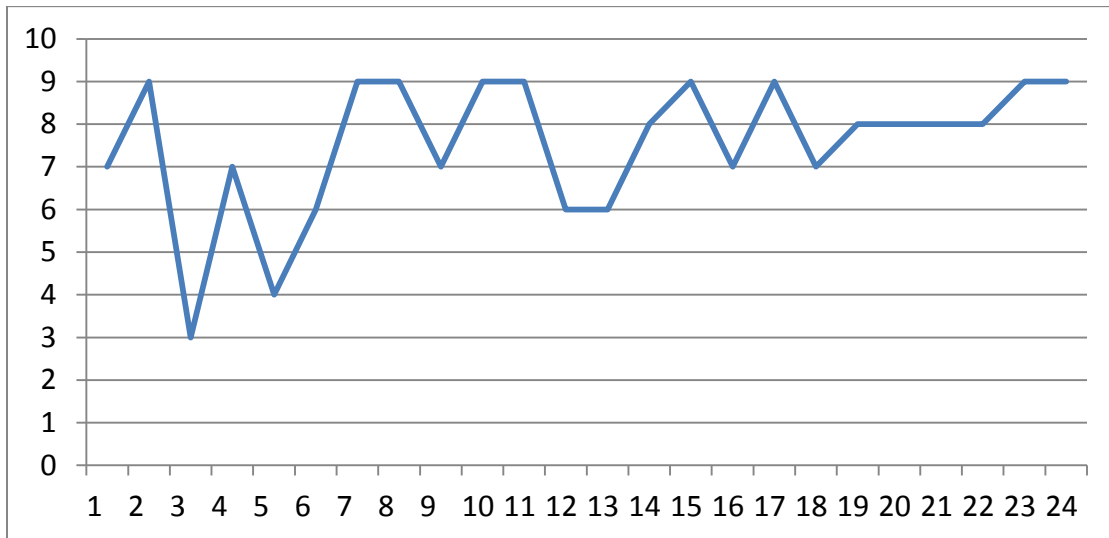


Figure 22. Subject 10's frequency of lowering the correct shade after being prompted

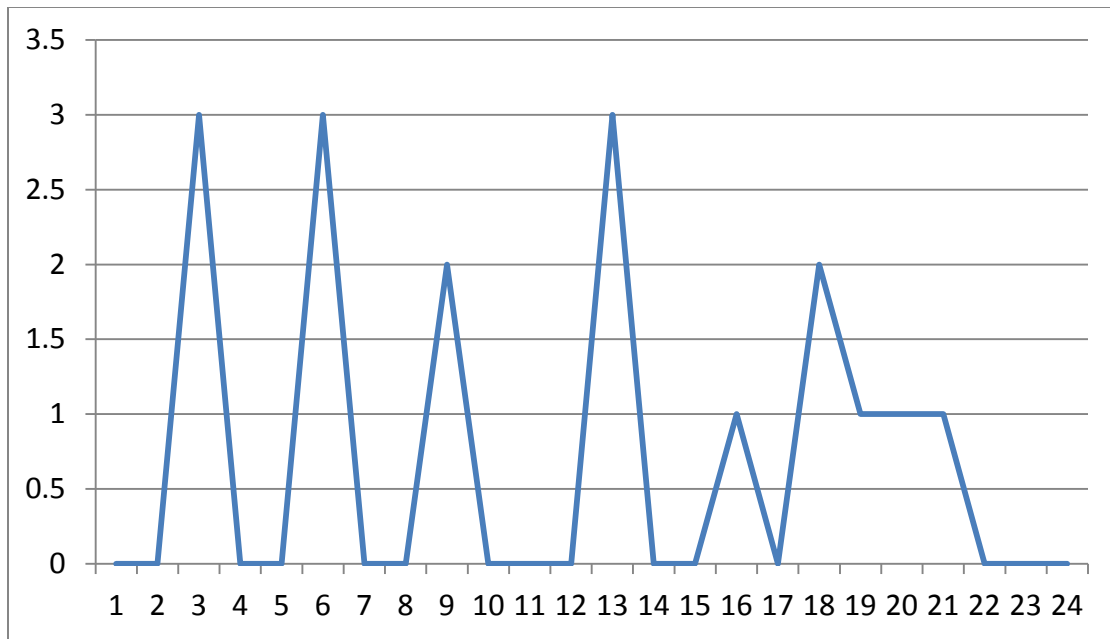


Figure 23. Subject 10's frequency of lowering the correct shade with assistance

Table 25. Frequency of behavioral occurrences for subject 10

| Behavior | # Times |
|---|---------|
| Verbally providing the correct answer | 0 |
| Lowering the correct shade prior to the answer being stated | 0 |
| Lowering the correct shade after the answer is known | 16 |
| Requiring prompting in lowering the correct shade | 190 |
| Requiring assistance in lowering the correct shade | 10 |
| Providing assistance to another player | 0 |
| Participating in the discussion (number of games) | 1 |

The majority of the Subject 10's behavior was "required prompting in lowering the correct shade." "Lowering the correct shade after the answer is known" occurred 16 times out of a possible 216.

Analysis

The descriptive behavior results noted for each of the subjects were obtained by the researcher by viewing the videotaped sessions. It was “hypothesized” that the negative behaviors such as “requiring prompting” and “requiring assistance” would decrease as the interventions progressed through the 12 weeks and that the positive behaviors such as “lowering the correct shade after the answer is known” would increase. This did not materialize. The majority of the behaviors exhibited at the beginning of the study stayed with the subjects throughout the 12 weeks. The subjects with the negative behaviors seemed to be not able to deviate from their initial behaviors and adopt the more positive behaviors.

Correlation Between FLCI and Memory Magic Answers

The exercising of long-term memory with the Memory Magic therapeutic program may have had an effect on the increased scores on the FLCI. The FLCI is a test that is designed to measure the ability of a person to answer questions that include specific answers and also open-ended questions that create a positive social environment. For example, the subject is shown a drawing of a 1950's car and asked to reminisce about events in their life associated with an automobile. The recall exercising of long-term memory with the Memory Magic game may have had an effect on the increased scores on the FLCI.

A correlation was used to determine the relationship between the FLCI scores and test scores, MMSE and test scores, and FLCI and MMSE scores. The

results shown in Table 26 indicate a strong relationship exists in the Test and FLCI scores.

Table 26. Correlation of FLCI to test scores

| | |
|---------------|------|
| FLCI – Test = | .999 |
| MMSE - Test = | .669 |
| FLCI – MMSE = | .669 |

Group Dynamics

This qualitative data report on the game playing behaviors will provide insight on the group's behaviors and the sociality created during each of the 24 Memory Magic game playing sessions. A typical game playing session began with the researcher arriving ahead of time to set up the cameras and ensure the correct game cards were placed on the table. As the participants arrived, they were greeted by the researcher with inquires such as how are you, followed by some small talk such as complimenting their appearance and "how was breakfast or lunch." Each session began with a prayer spoken by the researcher and followed by the Lord's Prayer. Five to seven participants would recite the prayer along with the researcher. Following the prayers, the researcher would explain how to play the Memory Magic game to the participants.

During the game playing times, the researcher or aid provided assistance to the participants as required. It was necessary for the researcher to establish a social interaction with each of the participants by involving them in answering,

closing their shutters, and fostering discussion pertaining to the game questions. When the participants reached the game's "bingo," they were verbally praised by the researcher. Two participants did not attend the first game playing session.

In the second week, Games 5 and 10 were played. At the beginning of game 5, it was noted that Participants 2 and 6 waved to each other. They were seated on the same side of the table with two other participants separating them. Beginning with this session and the remainder of the research sessions, candy and crackers were provided as a reward for obtaining a bingo. As the game progressed and participants achieved a "bingo," there were social incidents of conversation between the participants. The participants seemed to focus on playing the game and then towards the end begin to socialize.

Session four, Game 10, began with all 10 participants; however, one was taken away for toileting. She was back in time to fully participate in the game. The researcher greeted each participant and then asked the group, "What should we do first?" A couple of participants said "pray." All but two participants recited the Lord's Prayer. By the end of Week 2, the group was beginning to gel as a social group, participants were pulling down shades more often without prompting, the researcher was more relaxed, the discussions were richer in depth and content, and the time required to play the games increased.

Week 3's games were 2 and 8. Prior to starting the Game 2, Participants 1 and 7 were socializing across the table. Participant 10 had her eyes closed and Participant 6 sat with her head down on the table. Participant 4 was late to the

table and her husband accompanied her. He assisted her throughout the game. Participant 9's hearing aid was not functioning and a nurse replaced the battery. Seven participants joined in reciting the Lord's Prayer. Participant 1 while playing was prone to close her neighbors' shades in addition to her own. She wanted to be noticed and was quick to provide answers and discussions. For the first time, Participant 6 stayed for the entire game and closed the shutters with some prompting. The researcher worked at increasing the participation of the other players. Chocolate was the favorite choice after achieving a bingo.

During Game 8, all 10 participants were physically present. Eight of them participated in the prayer. The game was played and plagued with lack of participation in discussions, spontaneity, and one participant providing the answers. The researcher involved others by showing them the game card and asking a participant to read the words. Participant 10 fell asleep and Participant 6 desired to leave. This behavior of one participant providing most of the responses and others perhaps wanting to be someplace else is a situation frequently presented to a teacher. This behavior was thwarted by the researcher, who directed questions to a participant.

Week four games were 15 and 12. All 10 participants were present. Participants 1 and 9 were socializing as were Participants 8 and 7. Six recited the Lord's Prayer for the first time. During the game, Participant 4 desired to leave. The aide convinced the subject to stay at the table; however, the participant moved the game board away and did not involve herself in the game.

During Game 12, Participant 1 called herself a jackass. Others in the group said she was not. Playing the game provided some laughter. Participant 6, who used to desire to leave early, was getting nervous because six answers had been provided and none of the words were on her board. She seemed motivated to play. Participant 1 assisted Participant 5 in picking out a candy bar. This was the most socially interactive session yet.

Week 5 games were 2 and 9. Laughter ensued as we began Game 2. The lone male participant was asking an aide if he should be there, as there were no other males. The researcher happened on scene and so there were two males now. The participants enjoy the attention from the researcher when I say hello individually and help them individually. Participant 2 waved to Participant 6 half a table length away. Participant 6 wanted to leave. Others found that humorous and chuckled.

At the beginning of game 9, Participants 1 and 9 were holding hands, 1 and 7 were conversing socially. All 10 participants were present. Six persons participated in the Lord's Prayer. We commenced to play the game. Participant 9 was laughing; others were observing the aide and the researcher as they helped other participants. A lot of laughter ensued about the rolling pin answer and the possible uses of a rolling pin in the hands of a wife. Participants 9, 8, and 1 were the most social. When the bingos occurred the participants react favorably on their bingo. Their happiness increased and they selected their favorite treat.

Moving on to week 6 provided the opportunity to play Games 11 and 1. Nine participants were present. Six of them recited the Lord's Prayer. Participant 1

closed her own shutters when appropriate and also closed Participant 10's shutters correctly. Participant 10 almost always required prompting or assistance when her board had the word. She did not seem to mind the shutters being closed for her. The researcher asked Participant 1 not to lower Participant 10's shutters. There was laughter as we played the game and the researcher sang the first few lines of the national anthem. Participant 6 preferred sitting close to where the researcher was standing. All of the participants and the researcher enjoyed playing the game.

All 10 participants were present for Game 1. The researcher and Participant 9 were the only males. There were on occasion, jokes and laughter about roosters and the hen house and the lack of cooking skills. Everyone at one point or another interacted as the game was played. There was laughter pertaining to love and obey and a discussion in terms of God. Happy birthday was sung to one of the participants. Everyone was doing well listening, responding, and sharing information.

Week 7 began on June 19 with game 2. There were nine participants. Three participants required transporting to the game playing area. Others seated themselves. As they arrived, Participant 1 suggested Participant 3 sit next to her and she did. It was a positive social gesture; especially since they had not been on good terms previously. As a group, we discussed the group's experiences in playing bingo earlier in their lives. One participant volunteered the information that she used to call bingo. At one point earlier on, the researcher knelt down to help a participant find the word on their board and felt a hand on the back of my neck.

Subject one was smoothing down the researcher's hair on the back of his head. It was sticking out! The aid assisted Participants 5 and 10 and the researcher assisted Participant 4 and the others as necessary. There were lots of smiles as we discussed the answers. Most participants (six) focused on the researcher. There were smiles, gesturing, and participation in discussions.

The June 21st session began with nine participants. There was some laughter about there being only being two men in the group, the researcher and Participant 9. The researcher physically and verbally greeted each participant separately. Laughter occurred when discussing "money doesn't grow on tree." Participant 1 was helping Participant 8 with picking a treat from the candy box. The group was guessing who would have the next bingo. Laughter erupted when discussing the "exception to the rule" phrase. Participant 5 appears to be paying attention to my discussion about rules. Laughter and smiles demonstrated participants' happiness. The group sang the B-I-N-G-O song at the end of the game.

June 26th's memory magic game number was game 10. There were eight participants. The researcher shook hands with Participant 6 and she strived to continue holding hands. It was a nice gesture. A few smiles emanated from Participant 8. Six participants recited the Lord's Prayer. One participant took umbrage to the saying "It is a Wonderful Life." Cheers went out for Participant 1 as she pulled down the shutter after 6 previous words.

The scene prior to initializing game 8 was Participant 3 sitting at the table reading the newspaper and the rest waiting to begin. Subject 10 responded to the

researcher's question of "How are you today?" with OK. The researcher had a conversation with Subject 3 and her eye appointment and problems. The researcher went around the table and greeted each person. After the opening prayer, the Lord's Prayer was recited, and how to play the game was reviewed. Participant 2 arrived at the table. Researcher said good morning and inquired, "How are you?" to which she replied OK. The researcher told her, "Your nose looks better." She had a minor surgery a few days before. The game playing continued with looking for the word "milk." The addition of vitamin D was discussed. Participant 5 has the word on her board and required assistance on closing the shutter. Rest of the group is waiting patiently to continue. The researcher was quite animated in discussing the game's phrases. There was laughter throughout the game. Participant 1 complimented participant 8 on having a bingo. Participant 1 closed Participant 9's shutter. He did not seem to mind. Participant 2 was pleased she has a bingo and smiled. Participant 6 had a bingo and has not left yet. She never took a treat from the candy box. Participant 10 knows what she likes in the candy box.

The next session took place on July 3rd. The researcher inquired with each participant as to "how are you?" Participant 1's birthday was the next day. The group sang happy birthday. Researcher spoke to each participant establishing rapport. Everyone seemed to be happy. No one wanted to leave. The researcher explained how to play the game, said a prayer, and the group recited the Lord's Prayer. There was laughter throughout the game. Everyone was participating.

Participant 10 smiled when she attained a bingo. The group had fun with words indicating males such as fireman and firewoman. Session ended with laughter.

Prior to officially starting the July 5th game, Participant 1 shook hand of Participant 6 and then shaking the hand of Participant 2. Participant 1 and 8 were saying “boo” to each other across the table. Participant 3 became irritated and told Participant 1 to “shutup.” Participant 3 started a social conversation with Participant 9. Researcher started the game session with explaining how to play the game, followed by a prayer and the Lord’s Prayer. The group discussed the answers to the game’s phrases such as the cardinal being the official bird for the State of Ohio. On the “monkey” answer, the researcher imitated a monkey behavior. There was laughter. After the first bingo, the group sang the B-I-N-G-O song. Smiles and laughter were manifested throughout the game.

The July 10th session began with the researcher greeting each participant. There were nine participants. The aid was not present. A prayer was shared with the group followed by the Lord’s Prayer. The researcher emceed the game and provided assistance where and when necessary. There was laughter during the session.

July 12th’s session began with the usual greetings, prayer, Lord’s Prayer, how to play the game, and playing the game. Everyone played appropriately and received feedback from the researcher. There was some laughter about a man cooking and the use of a rolling pin. The participants laughed about the candy choices.

The maximum number of eight participants was present for the July 16th game playing session. The researcher greeted the participants and continued with the prayers and playing Game 2. The participants paid attention, smiled, closed shutters, and provided answers. Participant 6 wanted to leave, but the aid brought her back. The group sang “Happy Trails to You” at the end of the game. Participant 2 was laughing and Participant 3 was offering the candy box to Participant 9.

The researcher greeted and welcomed the seven participants to the game, explained how to play the game, offered a prayer, and then the Lord’s Prayer was recited. Six participants said the Lord’s Prayer. The group laughed because the researcher was also playing the game to get a bingo and select a candy bar. This was game 11, which provided the opportunity to sing. Participant 10 did not sing, but her smiles were noted.

All eight participants were present for the 23rd session. Participant 1 reached over the table to shake Participant 8’s hand. Participants 6 and 5 attempted to have a conversation across the table, however neither one understands the other. Participant 1 took the game board from across the table and placed it next to herself. Participant 2 arrives and Participant 1 gave her the board. Participant 5 appreciated being told by the researcher that she did a good job playing the game. The researcher thought she was going to cry, but she did not. There was a plethora of conversations throughout the game.

Six participants were present for the last game playing session. Participants 3 and 6 were absent. The researcher greeted the group, said a prayer, and provided

the opportunity to recite the Lord's Prayer. Five participants joined in. Game 2 was played. Participant 1 provided most of the answers, Participants 5 and 10 continued to require prompting and assisting to close the shutters, and participants 2, 8, and 9 continued to demonstrate their ability to play the game.

Summary Group Dynamics

Teaching others how to play the Memory Magic game and the answers to individual game questions was not unlike many of the other course topics the researcher has taught in the past 37 years. The "students" in this research context consisted of elderly persons diagnosed with dementia. As with many courses, the first few sessions will assist the teacher (researcher) in identifying the students (residents) that may require more or less attention and the participants' personalities, past experiences, and prior knowledge. It is typical to have "students" that already know some of the answers. The research design included a pre-test to determine prior knowledge. There is also a "get to know you" component related to the participant's knowledge of the researcher and the creation of a trusting relationship.

The success of "students" (participants) in a class is also dependent on the course content. The course content of the Memory Magic game assumes the "students" (participants) have previous knowledge of the correct responses. If that assumption is not met, the fall back is; only one person in the group has to verbalize the answer and then it becomes shared with others in the group. This is an example of the social-cognitive-Montessori learning theory. If none of the participants are

successful verbalizing the appropriate response, the game maker (Creative Action, 2005) provides cue cards with the answer printed in large type. Not having to know the answers to play creates a non-threatening, non-stressful environment that allows for the reduction of emotional stress and thereby creating a sharing, almost caring social environment.

Chapter II provided information on the learning theories of behaviorism, cognitive, and social cognitive which includes Montessori. The results of research studies that utilized the learning theories were also presented in Chapter II. See Table 3 for a list of the studies and their learning theory affinity.

The Memory Magic therapeutic game was designed to incorporate those learning theories by providing word completion questions and open-ended questions with a high probability that at least one player will have located the answer in their long-term memory and say out loud. One person with the correct answer provided the Montessori experience. If not, the game leader provided a hint by stating words that rhyme with the desired answer. These rhyming words are located on the backside of the playing card. The leader's goal was to stimulate the explicit memory areas of semantic (the word) and episodic (the context) of the participants' without having to give the answer. An episodic stimulation example on the playing card is, "the actor was known for smoking cigars" and/or "the actor lived 100 years."

Summary

The 12 weeks of intervention intraspaced with pre-tests, mid-tests and post-tests played out as planned, other than two subjects who were unable to stay the course. Kudos to the staff that assisted the researcher by ensuring the participants were in-place and prepared for the intervention sessions.

The MMSE results appeared to be a non-contributor in the analysis of the data. This was exacerbated by the requirement that the subjects provide answers to questions that were not dependent on accessing their long-term memory. The FLCI stood out as an assessment that required the use of long-term memory, as did the Memory Magic intervention, and therefore perpetuated the subjects' ability to increase the number of correct responses. The hypothesis pertaining to the comparison of the eight games played twice and Game 2 played seven times did not result in a greater increase of correct answers. The game-playing behaviors seemed to be cast in loose stone. The subjects' ability to adopt more positive behaviors was not forthcoming. The group's sociality increased as the Memory Magic therapeutic sessions advanced.

CHAPTER V

DISCUSSION

Discussion of Results for Each Hypothesis

This research project was conducted to determine if adults in Long-term care (LTC) with a diagnosis of dementia can increase their knowledge after an applied intervention over time. The research design embraced four hypotheses. In this section the researcher will explain and provide additional insight pertaining to each of the hypotheses. The chapter will continue with a discussion of the learning theory, implications, and conclude with justifications for replicating this study and proposals for additional studies.

Hypothesis 1

The MMSE scores will significantly increase from pre-test, mid-test, and post-test.

The groups' average for the MMSE pre-test was 11.62, mid-test 12.55, and 12.13 for the post-test average. Figure 24 graphically displays the results. The significance level was .384 ($p > .05$). Therefore, the hypothesis is not supported.

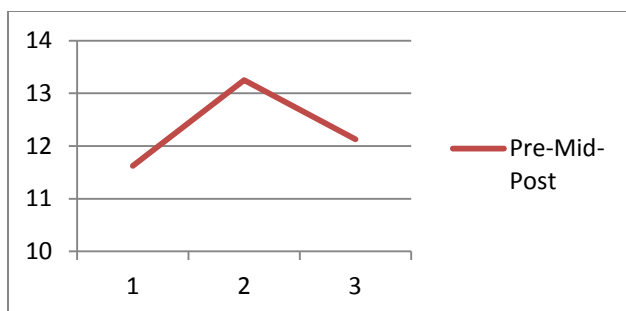


Figure 24. Average pre-test, mid-test, and post-test results for MMSE

The MMSE questions are placed into the categories of; orientation, registration, attention/calculation, recall, language, and visual-motor integrity. The orientation questions pertain to current events such as “what is today’s date.” The registration assessment checks for a person’s ability to remember three words. The attention/calculation category requires the person to count backwards by 7 from 100 or to spell the word “world” backwards. The recall section checks if the examinee can recall the three words given previously in the registration section. The language portion asks the person to identify a physical object such as a watch, and the ability of the person to repeat the phrase “No ifs, ands, or buts.” The assessee is asked to perform a three-step procedure such as “take a paper in your right hand, fold it in half, and place it on the floor.” Next, the subject is shown text asking the person to “close your eyes.” The next test pertaining to language is when the resident is asked to write a meaningful sentence. The last assessment section is visual-motor integrity. The assessee is asked to recreate the drawing shown in the assessment.

Those who are afflicted with Alzheimer's disease will find it difficult to remember current events. The formation of most new memories relies upon the areas of the brain named hippocampi. To form a new memory, the hippocampi will transfer the episodic and semantic information to long-term memory cells. If a person looks up a number in the phone book, they may forget the number before having the opportunity to dial the number. If one desires to remember new information and be able to recall later, the information has to pass to and through the hippocampi to long-term memory. The 30 MMSE questions require answers that do not relate to long-term memory.

The administration of the MMSE assessment begins with the test administrator introducing his/her self and the subject's name is verified. The testing process is void of a social environment. Questions are asked and answers are expected. The administration of the MMSE assessment test is not a teaching/learning process nor is it a social event.

It may be possible to "train" a person using spaced retrieval methods to state their room number when they are asked, "What is your room number?" Then, administering the MMSE and asking the subject to state their room number could result in a score one point higher. Spaced retrieval methods can be used as the teaching method as it takes advantage of an individual's procedural memory, which is not affected by compromised hippocampi. Procedural memory is located in the cerebellum, basil ganglia, and the motor cortex (Papalia et al., 2007). However, in

this study there were not any questions similar to the MMSE when playing the Memory Magic game.

Hypothesis 2

The FLCI scores will significantly increase from pre-test, mid-test, and post-test.

The significance level associated with the FLCI pre-test, mid-test and post-test was .083; not quite enough for the ($p > .05$) significance level chosen for this study. Therefore, the hypothesis is not supported. There was an increase as shown in Figure 25 from pre-test to mid-test with a much less increase from mid-test to post-test.

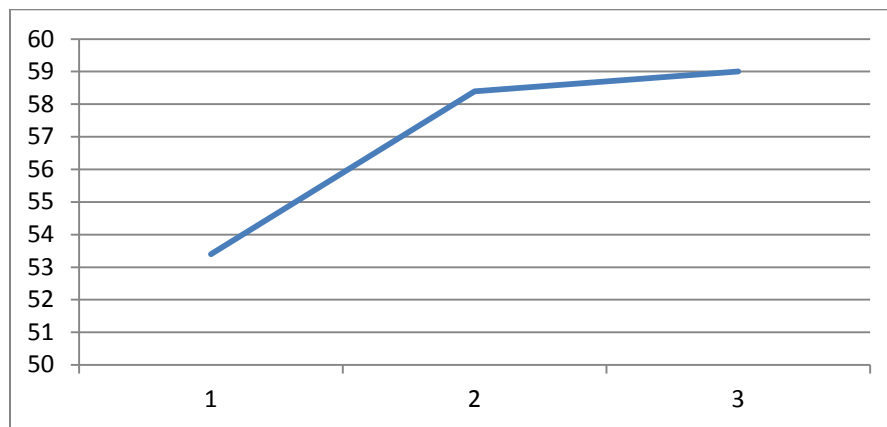


Figure 25. Average of FLCI scores

The FLCI is an instrument that is administered in a socially oriented environment. Question examples are:

- How are you today?
- What is your name?

- What is/was the name of your spouse?
- Where would you like to go on a trip?
- What is your favorite food?
- Which holiday do you like best?

These are questions with an answer that varies with an individual and invokes thoughts from the past; i.e., the answers come from long-term memories.

These memories were stored at a time when the hippocampi were healthy.

Recalling from long-term memory does not involve the hippocampi. The long-term memory consists of declarative and procedural memory. The declarative memory consists of episodic memories and semantic memories. The episodic memory provides the storage of Christmases past assuming the hippocampi were healthy.

Recalling the events' details such as who was present and what gifts were received is retrieved from semantic memory. Basically, any information brought in from the senses has the opportunity to be stored into long-term declarative memory and categorized as episodic memories and semantic memories. Recalling from long-term declarative memory can be stimulated by asking questions or showing objects from the past. Administering the FLCI provides that stimulus.

More on FLCI Non-Significance

The FLCI's non-significance level from pre-test to post-test was .08. It almost made it to the "significance level" of .05. Being that the result was an "almost" and since there are ten categories, it seemed appropriate to determine the significance levels for each category in a search of those that positively affected the overall

calculated significance level. Table 27 provides the calculated significant numbers for each category.

Table 27. The FLCI Categories

| Category | Pre-test | Mid-Test | Post-test | Sig. |
|--|----------|----------|-----------|------|
| Greeting and Naming | 9.50 | 10.00 | 10.38 | .38 |
| Answering Questions | 6.63 | 8.00 | 7.13 | .08 |
| Writing | 4.75 | 5.25 | 5.25 | .88 |
| Comprehension Signs/ Object-to-Picture | 4.38 | 4.50 | 4.50 | .91 |
| Word Reading and Comprehension | 12.13 | 13.13 | 13.38 | .08 |
| Reminiscing | 3.75 | 4.63 | 5.25 | .09 |
| Following Commands | 1.50 | 1.75 | 1.63 | .50 |
| Pantomime | 4.50 | 4.75 | 5.38 | .45 |
| Gesture | 3.00 | 3.25 | 3.25 | .64 |
| Conversation | 3.25 | 3.13 | 2.88 | .64 |

Note. The FLCI instrument was developed by Bayles & Tomoeda (1994). "Spericity assumed" significance levels were posted.

The Greeting and Naming items are tests of the subject's ability to respond to a greeting such as "good morning," shake hands, state their own name, recognize their printed name, state their spouse's name if applicable, and respond when shown drawings of items such as a pencil, comb, hanger, mask, dart, knocker, stethoscope, harmonica, and a compass. The drawing was that of a tool used to draw a circle. Only two of the eight subjects were ever successful naming this item as a compass. The significance of the growth in giving correct responses from pre-test to post-test for Greeting and Naming was .382 ($p > .05$).

The answering questions category required participants to answer open-ended questions such as, "What is your favorite holiday?" Another question was, "Are hearts associated with Easter, Valentine's Day, or Halloween?" Responding to these questions correctly as a pre-test, mid-test, post-test resulted in a significance level of .08 ($p > .05$) as shown in Table 33.

The third (III) FLCI language category is writing their name, a sentence about their self, and write words dictated to them. Writing ability created a significance level of .88 ($p > .05$) indicating the subjects had difficulty in providing the requested responses and did not positively add to the overall significance.

Comprehension of signs and object to picture matching also provided discord in reaching significance from pre-test to post-test for all categories. The significance specific to this category was .91 ($p > .91$). The subjects were shown drawings of items and asked a pertinent question. For example, subject was shown a drawing of a stop sign and asked "If you were driving your car and saw this sign, what would you do?"

The subjects performed well in the category of word reading and comprehension. They were shown a word and asked to say the word and then select the picture that goes with the word. The significance from pre-test to post-test for this category was .08 ($p > .05$).

Reminiscing is the next category. The subject was shown a drawing of a car from the 50s and asked to verbally respond with any memories the picture stimulated. Likewise, a drawing of a phone from an earlier time was shown and the

researcher prompted the subject to share any memories invoked by the visual drawing. The reminiscing significance level was .09 ($p > .05$).

The “following commands” category determined if the subject can follow one- and two-step commands. The subject was vocally prompted to make a fist and then to fold a piece of paper. The next command given was to “clap and close your eyes.”

The next category, pantomime, was used to determine if the subject can communicate through pantomiming. For example the subject was shown a drawing of a pencil and asked to demonstrate how hold and use a pencil. The significance level calculated for pantomiming was .45 ($p > .05$).

Gesturing was observed by asking the subject to give a salute, wave goodbye, pointed, and blew a kiss. The gesturing significance level from pre-test to post-test was .64 ($p > .05$).

The last category is conversation. Conversation was prompted by the researcher giving a compliment to the resident and hearing a response from the subject. Three other prompts for conversation are saying something incorrect and waiting for a correction from the subject, the subject contributed to the conversation, and waiting for a meaningful response back to the researcher’s closing comment.

Table 23 listed the question categories, the average scores for each category, and the achieved significance level for each category. Although the results were not significant overall, .08 ($p > .05$), it was worth the effort to discuss the results of each

category and the significance of the average scores across all subjects for the pre-test, mid-test, and post-test groups. Answering Questions, Word Reading and Comprehension, and Reminiscing provided the most non-significant values.

Hypothesis 3

The participants' knowledge of the board game's answers will significantly increase from beginning to the middle and towards the end of the game intervention.

The game intervention for the study was Memory Magic, a therapeutic program. The data analyzed revealed that hypothesis 3 was significant, .01 ($p < .05$). Figure 26 provides a visual of the growth from pre-test, mid-test, and post-test.

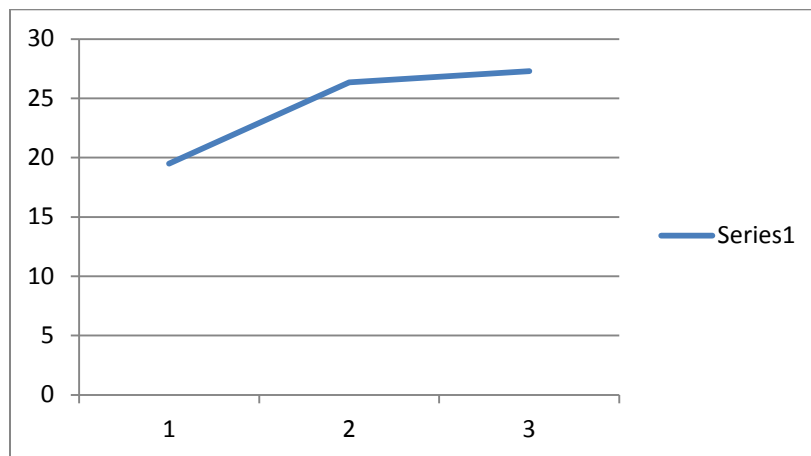


Figure 26. Average of forty question test scores

Forty Question Test Scores

The questions included completing nursery rhymes, stating the names of actors and actresses and the movies they starred in, words to songs, proverbial statements such as “a stitch in time saves nine,” etc. Many of the answers were

already in the subject's memory. Recalling and stating the correct answer comes from the subjects' long-term declarative episodic and semantic memories. The long-term memory cells are located throughout the cerebrum including the frontal lobe, parietal, temporal lobes, and occipital lobe.

If the subjects provided the correct answer to the Memory Magic phrase or question they received one point. If subjects could not recall the correct word after hearing and seeing the game's phrase or question, they were given a 3 x 3 matrix of nine words with one word being the answer. A correct selection resulted in .75 points. If the participant was unable to select the correct word, they were given up to two words that rhyme with the correct answer and asked to state the answer shown on the 3x3 matrix. A correct answer was worth .5 points. If this was not accomplished, the participant was shown the correct answer on the 3x3 matrix and asked to state the word and receive .25 points. Not being able to state the word resulted in a score of zero for the question. All of the eight participants increased their scores from pre-test to post-test. Was the increase due to learning the correct answer to which they did not have any prior knowledge of, or, was the increase related to reviving an old memory?

The data tables in Appendix N show a knowledge increase from 0 at pre-test to a 1 at post-test achieved for each subject. It is possible that a partially damaged hippocampus may still have the ability to transfer input from the senses into long-term memory. Medical procedures such as PET scans or MRI's are required to provide evidence and clarification.

Another possibility for memory storage and retrieval is located in the cerebellum. This memory is called implicit memory with a sub category of procedural. Procedural memory does not rely upon the hippocampi for the storage of new information. Procedural memory can contain motor and cognitive information (<http://thebrain.mcgill.ca/avance.php>).

One method for teaching a person motor skills and cognitive skills is spaced retrieval. An example is teaching the person their room number. A therapist may ask of the subject, “what is your room number.” With no correct response within a few seconds, the therapist will state, “your room number is 9.” Almost immediately, the question of “what is your room number” will be asked. Assuming a correct answer, the therapist will repeat “good, your room number is 9.” The therapist will again pose the question, “What is your room number.” This continues with increasing time before asking the question again. Perhaps, the memory magic game statement, one two, buckle your _____ stated during the game and during the pre-test, mid-test and post-test periods was instrumental in recalling the correct word.

Hypothesis 4

The comparison of increasing scores for games 1, 5, 8, 9, 10, 11, 12, 15 with game 2 will be significantly less.

Twenty-four Memory Magic games were played over 12 contiguous weeks with two games per week. Nine different games were available. Most games were played twice, one game was played three times, and Game 2 was played seven

times. This was done by design to determine if a game played more often would result in a greater score increase. Table 22 showed positive score correlations between the nine games and Table 23 displayed the scores which provided additional evidence that the score increases for Games 1, 5, 8, 9, 10, 11, 12, and 15 were not less than game 2. Therefore, the hypothesis is not supported.

The test for correlations between games 1, 5, 8, 9, 10, 11, 12, 15 and 2 are shown in Table 18 and indicate a positive correlation. Using the intervention as the delivery vehicle for Game 2 played seven times may not have provided the intensity required for the participants to score higher compared to the correct answers for the other games. Applying the spaced retrieval technique (Camp & Foss, 1997; Camp, Foss, Stevens, & O'Hanlon, 1996; Sterns & Camp, 1998) may be required to achieve a meaningful increase of the correct answers associated with Game 2.

Learning Theories

The three dimensions of learning as stated by Illeris (2002) are; emotion, environment and cognition. Emotion implies sensibility and the mental balance necessary to remain alert and engaged in the learning process. Research conducted by Sterns et al., (2005) provided evidence that the Memory Magic game has proved its mettle as a comprehensive, therapeutic program that encourages engagement, improves affect, and reduces undesired behaviors. The environment included a physically comfortable setting and barriers to seeing and hearing were minimal. It was a friendly and sociable gathering. The cognitive functionality includes understanding and the ability to perform. The cognitive abilities for the research

participants have been compromised by dementia. The purpose of playing the games was to increase the participants ability to provide the correct response to the information provided on the games cue cards. And, in fact, study subjects did respond with answers, closed shutters, remained seated, and looked forward to the bingo and the candy box. They connected with each other in conversations, singing, and discussions. All of this created a fun time with a benefit of cognitive growth.

The social-cognitive learning theory is applicable when teaching a group of adults with dementia and living in a long-term care center. The stages of dementia can begin with mild cognitive impairment and progressively worsen to severe cognitive dementia. One of the defining characteristics of the social cognitive learning theory is that learning occurs through the observation of others (Merriam et al., 2007) if a social environment exists. For example, subject one modified her behavior pertaining to her desire to monopolize the conversation. The Memory Magic therapeutic game intervention provided the stimulus to create a social environment.

The researcher believes these two learning theories (Illeris and social-cognitive) complement each other, and are appropriate when applying cognitive stimulation for adults with dementia living in long-term care. The significance of the results pertaining to hypothesis three provides at least a glimmer of hope for increasing knowledge in the minds of those afflicted by dementia. It was a small sample and will require replication and future modifications to shore up the findings presented in this dissertation document.

In summary, there is a need and purpose in creating additional social based games that provide the possibility of teaching those with dementia from the creation of and use of more social based assessments of learning and applied as interventions.

Implications

The results of the pre, mid, and post tests for Hypothesis 3 revealed that individuals diagnosed with dementia can increase their knowledge of the correct answers to the Memory Magic intervention. The research also demonstrated that a socially interactive intervention can be applied to a group of persons with a medical diagnosis of dementia. Other interventions that provide a similar social environment need to be created or purchased to increase knowledge.

Social Environment Interventions

An internet search for these interventions using the words of “educational programs for the elderly in long-term care” provided website information pertaining to education for families and, education and training of nursing home staff, but none pertained to programs for long-term care. Modifying the search words to “educational and training programs for the elderly in long-term care” intensified the focus on educating and training families and staff. A search on “educational activities for residents in long-term care” and “educational opportunities for residents in long-term care” was not fruitful either. There does not appear to be, socially friendly educational and training programs specific to residents in long-term care that may increase their knowledge?

A partial answer is buried in the Google™ search words “activities for residents in long-term care.” This will reveal web sites of commercially available activities appropriate for residents living in long-term care. Researching the various sites though does not reveal the activities’ outcomes in terms of learning. Perhaps there is learning, however one will not know unless the educational results are listed, i.e., learning objectives, and the necessary pre, mid, and post tests. The cognitive component of knowing that or knowing how appears to be irrelevant . Perhaps “activities” could be restated as socialearning [sic] containing Illeris’s (2002) three dimensions of learning theory, with the activity’s (intervention) learning outcomes stated and measured through pre, mid, and post assessments.

The current emphasis seems to be on using activities to keep residents entertained and to reduce behaviors such as agitation. The goal is to have fun assembling puzzles, singing familiar tunes, drawing pictures, sorting buttons, joining together in finding a word, drawing pictures, etc. However, it may be possible to use activities to increase a resident’s knowledge and skills that “add more life to their years.”

The researcher located some activity book titles that may prove useful for cognitive stimulation and training interventions. The book authors and titles can be found in Appendix O.

Potential of Developing Interventions

If socially friendly activities with a learning component for residents in long-term care resulting in an increase in knowledge and/or skills are not available, it

will be necessary to develop them. This may require hiring educators skilled in developing courseware targeted to residents in long-term care or locating qualified volunteers.

A plan to provide education and training to residents requires current cognitive assessment results. After testing, classifications of the assigned cognitive level for a resident could be; cognitively well, mild cognitive impairment, mild dementia, moderate dementia, and severe dementia. The interventions for residents could consist of teaching new knowledge and reviewing/renewing previous knowledge, mental exercises, training, and sensory inputs. The learning theories and pedagogies to consider are; Montessori, constructivism, social cognitive, Socratic questioning, and behaviorism. For those residents with severe dementia, the interventions may be sensory and applied through touch, lighting, and/or music.

Successfully empowering residents with skills and knowledge can have positive psychosocial benefits such as increased confidence, usefulness, and additional, meaningful abilities. As an example, the researcher donated a computer to a long-term care center and taught an 84-year-old female resident how to access and use the computer to play card games. A Yahoo email account was also created for the resident and she was taught how to receive and send emails. It allowed her to communicate with friends and family and remain a part of their lives.

As an example of developing an interaction, the researcher taught an 88-year-old male resident how to play golf using the Wii™ game. After administering

all the assessments and evaluating the results, the researcher developed a golf-related intervention. The researcher assisted the resident in learning how to use the Wii™ remote to tee off and eventually putt the ball into the cup. This man was afflicted with Alzheimer's disease. When the researcher would come to the LTCC and ask the resident "would you like to play some golf" his typical answer was "I don't have my golf bag." After a gentle reminder of "We can play on the TV," he said OK. The researcher and the resident positioned themselves on chairs and commenced to tee off. It took two or three sessions of playing before the resident learned how to hold the control and press the buttons. The researcher and the resident played once a week and each time was new for him. He never remembered the researcher's name, always forgot his clubs, and expressed surprise about playing golf on the TV. However, he remembered the motor skills required to use the remote after the second or third week. It is very likely that the knowledge was now stored in his procedural memory. With the remote in his hand, he teed off and game was on. He understood the game as he played golf throughout his life. Later the researcher located a 95-year-old male resident in the same facility and the two residents played golf together.

In addition, the resident's great-grandson came to visit and the researcher was able to observe, the two of them playing golf together. There can many more of these stories.

Center for Medicare and Medicaid Services (CMS)

The CMS has updated their mission to upgrade the care of long-term care residents with an emphasis on reducing antipsychotic medicines and increasing person-centered approaches such as activities. Below is the announcement provided.

On March 29, 2012, CMS launched a national partnership with the mission to improve quality of care provided to individuals with dementia living in nursing homes. This partnership focuses on the delivery of health care that is person-centered, comprehensive and interdisciplinary, in addition to protecting residents from being prescribed antipsychotic medications unless there is a valid, clinical indication and a systematic process to evaluate each individual. The partnership promotes rethinking approaches that are utilized in dementia care, reconnecting with people using person-centered care approaches and restoring good health and quality of life in nursing homes. CMS is partnering with federal and state agencies, nursing homes, other providers, advocacy groups, and caregivers to improve dementia care. The partnership promotes a multidimensional approach that includes public reporting, national partnerships and state-based coalitions, research, training for providers and surveyors and revised surveyor guidance.

The Advancing Excellence in America's Nursing Homes Campaign has offered to make available a variety of resources and clinical tools to assist nursing homes achieve the goals of this partnership. Nursing homes are encouraged to review the resources and tools and select those that will be most useful. This site will be updated regularly as new tools become available." (http://www.nhqualitycampaign.org/star_index.aspx?controls=dementiaCare, 2012)"

The golf game is an example of an intervention applied in a social environment that meets the call of CMS for additional person-centered activities.

Potential Related Activities

Professional Organizations

Functioning as an active member in education and gerontology organizations can be helpful for practitioners working with long-term care adults diagnosed with dementia. The sharing of information will assist members in research endeavors, guide and expose them to current and past research results, identify pertinent literature sources, and identify effective methods to increase the quality of life for those with dementia.

Examples of organizations are: Gerontological Society of America (GSA), Ohio Association of Gerontology and Education (OAGE, and Alzheimer's Association. These organizations provide resources related to gerontology in the forms of documentation, education, current happenings, and developing professional relationships with others with an interest in gerontology. .

The GSA was established in 1946 (Wilmoth & Ferraro, 2007). Members are interdisciplinary coming from the fields of social and behavioral science, biomedical, humanities and engineering (Wilmoth & Ferraro, 2007). The Gerontological Societies web site is www.geron.org. A national conference is held every year.

Another organization is the Ohio Association of Gerontology and Education. The OAGE website's (www.oage.org) mission statement is:

OAGE is an association of educators, researchers, professionals, , and students in Ohio dedicated to gerontological education, research and practice. The organization promotes gerontological education, supports

Ohio's aging network as a resource for research and practice, and provides professional development for students, faculty and professionals.

An annual conference is held at one of the state's universities.

The Alzheimer's Association is a national organization with local chapters. The web site, (<http://www.alz.org>) provides current information pertaining to research, education on Alzheimer's disease, and conferences; international, national and locally. The organization is an advocate for those with AD and the associated caretakers.

The researcher has been an educator of adults in higher education and in the work place for 39 years. The researcher's desire is to remain an educator with a focus on those persons who are residents in long-term care. Becoming an active member in organizations that share the researcher's interests will provide the opportunities for research, presentations, and publications.

Research

Because one of the hypotheses was found to be significant, it is important to replicate this research at other long-term care centers with individuals diagnosed with dementia. The additional data collected will assist in ensuring if the learning process was real and will help clarify the individuals' learning processes.

The content of the memory magic intervention contains phrases and questions familiar to a population born in the early to middle 20th century. The ability to respond correctly to the memory magic cue cards was provided by the participants' long-term memory and perhaps from renewed memories and new memories forged during the playing of the games. Eventually though, it will become

necessary to create games that result in learning new information followed by the application of the knowledge. The researcher is exploring the possibility of increasing a subject's ability to associate a face with a name through the playing of a sociable game. Faces that could be displayed include cartoon characters, biblical pictures such as Moses, David and Goliath, famous people from entertainment, politicians, nursing home staff, the subjects' own picture and personal family pictures. The name-face recognition will rely on the subjects' prior knowledge and most importantly the recall of the names for a face not previously known will be measured.

Creative Action has recently added additional game cards to the Memory Magic product (www.memorymagic.com). The topics are: Animals, Christian Memories, Old Testament, and New Testament. Illeris's three dimensions of learning; cognition, emotional, and environmental will continue to provide the learning theory.

Summary

Chapter V provided a look back at the study through the hypotheses eyeglass. All of the hypotheses, significant or not, provided insight on the study's outcomes. For example, an analysis of the individual FLCI categories revealed the subjects' increased ability in providing the correct responses during the mid-test and post-test assessments. Sociality is important in the process of applying an intervention and administering assessments. There was an increase in knowledge evidenced by the pre-, mid-, and post-test scores pertaining to the games'

responses. Although statistically significant, the introspection revealed the possibility that the ability to provide the correct answer during the mid- and post-tests may not have been a new memory for the subject, but a refresh of knowledge already present. The researcher emphasized the creation of additional interventions and research and, the importance of keeping oneself immersed in creating and applying cognitive stimulation to long-term care adults with dementia.

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APPENDICES

APPENDIX A

LONG-TERM CARE EXPERIENCE

This section is provided for readers that may not have experience with long-term care. It describes the case of one individual and her seven years living in a long-term care center.

Mrs. Smith lived in the community for 40 years and was socially active through church membership and social club memberships such as the VFW Ladies Auxiliary. At one point in her life, she obtained a real estate license and sold real estate in the community. When the idea of establishing a Senior Center in the community was advanced in 1987, she helped with its formation and became the director of the senior center for the next 6 years.

Her husband passed 8 years before she entered the nursing home. After his death, she continued to live in their single family home for 5 years before selling the property and then moving to the senior apartments where she resided for 3 years. She entered the nursing home at the age of 69 years.

At the age of 72 she had been resident of a long-term care center for 3 years. She had been plagued with arthritis in her knees and right hip since the age of 60 years old. The arthritis affected her mobility and resulted in a fall, which caused a fractured hip. After 2 months of residence in a physical rehabilitation facility, it

became apparent that she was not going to be able to live alone without assistance in performing the activities of daily living. Her children were not in a position to take her into their home and she did not have the financial resources to hire a full-time caregiver. She felt that the best path to follow was to enter a nursing home. After 2 months in the nursing home she decided to sell her belongings and not renew her lease on the apartment she was renting and accept the nursing home as her new residence.

When she entered the nursing home she was given a cognitive assessment titled "Mini-Mental State Exam" (Folstein, Folstein, & McHugh, 1975). Her score for the assessment was 29 out of a possible 30 points. This score is indicative of someone who is cognitively healthy. Although she was physically compromised by the arthritis she had no cognitive difficulties. She continued to pay her bills, send greeting cards, play Euchre, read books, attend bible study and visit with family in the long-term care center and in their homes, attend church, go shopping, and sightsee locally. Her family owned a van, which allowed her to be transported in a wheelchair. Her meals were provided within the home although she sometimes preferred to order pizza or fish dinners from local restaurants. The cost of the care she received was paid for by her savings and long-term care insurance. After residing in the nursing home for 5 years those monies were depleted and she transitioned from private pay to the government Medicaid program. Medicaid paid the monthly long-term care costs. Medical expenses and prescription drugs were paid for through Medicare, supplemental Medicare insurance and out of pocket. If

she incurred a medical expense of \$100, \$80 was paid by Medicare, \$16 from the supplemental insurance, and \$4 out of her personal funds. Her income consisted of a pension from her deceased husband's railroad retirement and VA benefits she received because of her husband's Army service during WW II. All of these monies except for \$40 per month and the monthly VA benefit of \$90 were funneled to the Medicaid system.

She gave up her privacy and dignity by entering a long-term care center. It was necessary for her to share a room with another resident. Some roommates were not cognitively intact and were psychologically impacted and had the tendency to yell and even scream at any time and for no specific reason. At one point she had a roommate who was slightly demented but physically capable of pushing Mrs. Smith down the hallway and into the dining room. Eventually, Mrs. Smith received a "script" from her doctor that specified the need for a motorized wheelchair. This was ordered and paid for by Medicare. This provided her with a little more independence even to the point of being able to travel out the front door of the facility and across a parking lot to the senior citizens center where she could visit with the members, attend Bible study, and play in Euchre tournaments. She received a shower twice a week whether she needed it or not and at a time of day determined by the nursing staff. Because she was unable to walk, it was necessary for her to be physically transferred from the bed to the wheelchair and back. This required the assistance of two nursing aids and a mechanical lifting device. The name of the device is a Hoyer Lift.

To obtain the attention of the nurse aids and summon them to her room, she had to press a button by her bed that would activate a call light and cause a beeping sound. Sometimes the aids were busy attending to another resident and could not respond very quickly to the call light. Being a sentient person, Mrs. Smith was able to perceive that perhaps there were certain aids not interested in the well-being of the residents.

The standard bed in the nursing home had two cranks at the foot of the bed that could be used to adjust the foot and head of the bed. If she was in bed and desired an adjustment, it was necessary to summon a nursing assistant. Fortunately for Mrs. Smith, her physician also wrote a prescription specifying the need for a motorized bed. Also, because of the timeliness of having an aide appear, it was necessary for Mrs. Smith to wear incontinent briefs.

Mrs. Smith remained a resident of the nursing home for 7 years. Her death was caused by pneumonia. She remained cognitively intact during her tenure in long-term care. This was due to her positive attitude, seeking out others in the nursing home to commune with, functioning as an advocate for other residents, participation in activities such as Bible study, a desire to remain mentally active, reading books, newspapers and a supportive family that visited and took her to church and family gatherings.

APPENDIX B

ACTIVITIES OF DAILY LIVING (ADL'S) AND INSTRUMENTAL

ACTIVITIES OF DAILY LIVING (IADL'S)

The "activities of daily living," or ADLs, are the basic tasks of everyday life, such as eating, bathing, dressing, toileting, and transferring. The iADL's requires a higher level of cognition; i.e., knowing the what and knowing the how (Wilmoth & Ferraro, 2007).

Activities of daily living include the following personal care items of:

- Eating
- Bathing
- Dressing
- Toileting
- Transferring

iADL's

Instrumental activities of daily living include items such as:

- Meal preparation
- Shopping
- Paying bills and managing money
- Using the telephone
- Housework from straightening, dusting to cleaning the floors
- Managing medications

APPENDIX C

SAMPLE PAGE FROM WRITTEN TEST

6. People in glass houses shouldn't
throw _____.
8-07
7. A person who fixes the plumbing is
a _____.
2-02
8. She'll be coming around the
_____.
11-07
9. Blood is thicker than
_____.
12-04
10. One, two, buckle my
_____.
14-06

APPENDIX D

MEMORY MAGIC THERAPUETIC PROGRAM BOARD



Source: Creative Action, LLC, 2014 Used by permission

APPENDIX E

MEMORY MAGIC PROGRAM THERAPUETIC CALLING CARDS



Source: Creative Action, LLC, 2014 Used by permission

APPENDIX F

A MEMORY MAGIC THERAPUETIC PROGRAM GAME QUESTION

WHAT THE ACTIVITY DIRECTOR SEES



Source: Creative Action, LLC, 2014 Used by permission

A MEMORY MAGIC™ GAME QUESTION: WHAT THE PARTICIPANT SEES.



Source: Creative Action, LLC, 2014 Used by permission

APPENDIX G
CONSENT LETTER

Letter of Consent

**For resident's participation in Tom Kellar's doctoral
dissertation research study.**

Dear _____, POA of _____ (Resident Name),

I am a doctoral student pursuing my PhD in Education at the College of Education, University of Akron. One of the requirements for the degree is to complete a dissertation and research study. My interest is education of adults, specifically those adults who are residents of a long-term care center. My hypothesis is: the elderly in long-term care can cognitively benefit from interventions that stimulate the mind and improve the person's quality of life.

The participants for my research study will be selected from residents in the Memory Unit at Saint Joseph Care Center. The study subjects will be asked to complete the cognitive assessments of the Mini-Mental State Exam (MMSE) and the Functional Linguistic Communication Inventory (FLCI). The subjects will also play a memory board game called Memory Magic® and be asked questions pertaining to the game. An example question is: "It's not my cup of _____. Please

complete the sentence.” The game playing sessions will be videotaped so that additional cognitive observations can be obtained while playing the Memory Magic® board game. These observations are: length of response time, level of participation, discussion time, and level of assistance given and received. After 12 weeks of playing the game, the subjects will be retested with the MMSE, FLCI, and answering questions pertaining to the game. In addition, the researcher will be accessing the participants’ medical records to record their scores on previous cognitive tests.

The presentation of the research results will not contain any identifiable information from the participant. Participants’ names will be replaced with Subject 1, 2, 3, etc. Originals of resident documentation will not be copied or removed from their records. Any identifiable documentation such as video tapes will be kept in a locked box in a locked file cabinet. All information obtained during the study will remain confidential and will meet HIPAA guidelines. Every effort will be made to ensure the privacy and confidentiality of the resident’s personal information.

Your consent to participation will provide data that will help determine if mental therapy will improve a person’s cognitive abilities. If this proves to be true, it may be possible to improve the quality of life for the elderly and perhaps extend the amount of time an elderly person may continue their lives outside of a long-term care center.

By signing this form you agree to allow the resident to participate in this study. You may remove the resident from the study and discontinue their participation at any time.

If you have any questions about this study, feel free to contact me, Thomas Kellar, at 330-877-2788. This study has been approved by The University of Akron Institutional Review Board (IRB). For questions about the rights of research participants contact the IRB at (330) 972-7666.

I, _____ POA of _____ consent to her / his participation in the research study.

Date: _____

Thank-you,

Tom Kellar

APPENDIX H
HIPAA AUTHORIZATION FORM

I, _____, POA for _____ give
permission to Saint Joseph Care Center to use the following protected health
information and disclose the following protected health information to the
researcher Thomas W. Kellar.

Information to be disclosed:

Medical Records

This protected health information from the medical record is being used or
disclosed only for the purpose of obtaining cognitive information. The identity of
the person and corresponding scores will be anonymized to ensure privacy.

This authorization expires upon the completion of the research study. You may
revoke this authorization in writing at any time by sending written notification to
Saint Joseph Care Center, Louisville, OH. Your notice will not apply to actions taken
by the requesting person/entity prior to the date they receive your written request
to revoke authorization.

Signature of Participant or Personal Representative


Date_____

Printed Name of Participant or Personal Representative

Description of Personal Representative's Authority

APPENDIX I


IRB APPROVAL LETTER 2011



NOTICE OF APPROVAL

February 7, 2011

Thomas W. Kellar
Curricular and Instructional Studies
The University of Akron
Akron, Ohio 44325-6002

From: Sharon McWhorter, IRB Administrator 

Re: IRB Number 20110112 "*Mental Stimulation of Adults in Long-Term Care*"

Thank you for submitting an IRB Application for Review of Research Involving Human Subjects for the referenced project. Your protocol represents minimal risk to subjects and has been approved under Expedited Categories #5/6/7.

Approval Date: February 7, 2011
Expiration Date: February 7, 2012
Continuation Application Due: January 24, 2012

In addition, the following is/are approved:

☐ Waiver of documentation of consent
☐ Waiver or alteration of consent
☐ Research involving children
☐ Research involving prisoners

Please adhere to the following IRB policies:

- IRB approval is given for not more than 12 months. If your project will be active for longer than one year, it is your responsibility to submit a continuation application prior to the expiration date. We request submission two weeks prior to expiration to insure sufficient time for review.
- A copy of the approved consent form must be submitted with any continuation application.
- If you plan to make any changes to the approved protocol you must submit a continuation application for change and it must be approved by the IRB before being implemented.
- Any adverse reactions/incidents must be reported immediately to the IRB.
- If this research is being conducted for a master's thesis or doctoral dissertation, you must file a copy of this letter with the thesis or dissertation.
- When your project terminates you must submit a Final Report Form in order to close your IRB file.

Additional information and all IRB forms can be accessed on the IRB web site at:
<http://www.uakron.edu/research/orssp/compliance/IRBHome.php>

Cc: Lynne Pachnowski- Advisor
Cc: Stephanie Woods - IRB Chair


☒ Approved consent form/s enclosed

Office of Research Services and Sponsored Programs
Akron, OH 44325-2102
330-972-7666 • 330-972-6281 Fax

The University of Akron is an Equal Education and Employment Institution


APPENDIX J

IRB APPROVAL LETTER 2012


NOTICE OF APPROVAL

February 7, 2012

Thomas W. Kellar
Curricular and Instructional Studies
The University of Akron
Akron, Ohio 44325-6002

From: Sharon McWhorter, IRB Administrator 

Re: IRB Number 20110112-2 "Mental Stimulation of Adults in Long-Term Care"

Thank you for submitting your Application for Continuing Review of Research Involving Human Subjects for the referenced project. Your protocol represents minimal risk to subjects and has been approved under Expedited Categories 5,6,7.

Approval Date: February 7, 2012
Expiration Date: February 7, 2013
Continuation Application Due: January 24, 2013

In addition, the following is/are approved:

☐ Waiver of documentation of consent
☐ Waiver or alteration of consent
☐ Research involving children
☐ Research involving prisoners

Please adhere to the following IRB policies:

- IRB approval is given for not more than 12 months. If your project will be active for longer than one year, it is your responsibility to submit a continuation application prior to the expiration date. We request submission two weeks prior to expiration to insure sufficient time for review.
- A copy of the approved consent form must be submitted with any continuation application.
- If you plan to make any changes to the approved protocol you must submit a continuation application for change and it must be approved by the IRB before being implemented.
- Any adverse reactions/incidents must be reported immediately to the IRB.
- If this research is being conducted for a master's thesis or doctoral dissertation, you must file a copy of this letter with the thesis or dissertation.
- When your project terminates you must submit a Final Report Form in order to close your IRB file.

Additional information and all IRB forms can be accessed on the IRB web site at:
<http://www.uakron.edu/research/orssp/compliance/IRBHome.php>

Cc: Lynn Pachnowski - Advisor
Cc: Stephanie Woods - IRB Chair

☐ Approved consent form/s enclosed

Office of Research Services and Sponsored Programs
Akron, OH 44325-2102
330-972-7666 • 330-972-6281 Fax

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APPENDIX K

3 X 3 ANSWER MATRIX

TOMORROW

STALK

TREES

MOUNTAIN

MECHANIC

HARRY

WATER

SHOE

SINKER

APPENDIX L

OBSERVATIONS TABLE

| Game Number 1 – 24 | | | | | | | | Subject 1 – 12 | | | | | | | |
|--------------------|----------|----------|----------|----------|----------|----------|----------|----------------|----------|----------|----------|----------|----------|----------|----------|
| Behavi ors | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me |
| 1 | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | |

APPENDIX M

OBSERVATIONS TABLE WITH DATA

| Game Number 1 | | | | | | | | Subject 10 | | | | | | | |
|--|----------|----------|----------|-----------|-----------|-----------|-----------|---|----------|----------|----------|----------|----------|----------|----------|
| Behav iors | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Tim e | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me | Ti me |
| 1 | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | 7:3 9 | 10: 17 | | 13: 31 | 14: 05 | 15:4 0 | | | | | | | |
| 5 | 3:3 0 | 3:5 5 | | | 12: 02 | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | |
| 1. verbally providing the correct answer | | | | | | | | 5. requiring assistance in lowering the correct shade | | | | | | | |
| 2. lowering the correct shade prior to the answer being stated | | | | | | | | 6. providing assistance to another player | | | | | | | |
| 3. lowering the correct shade after the answer is known | | | | | | | | 7. participating in the discussion | | | | | | | |
| 4. requiring prompting in lowering the correct shade | | | | | | | | | | | | | | | |

APPENDIX N

SCORES

| Subject One | | | |
|-----------------|----------|----------|-----------|
| Question number | Pre-test | Mid-Test | Post-Time |
| 18 | 0 | 1 | 1 |
| 20 | 0 | .75 | 1 |
| 32 | 0 | 1 | 1 |
| Subject Two | | | |
| Question number | Pre-test | Mid-Test | Post-Time |
| 25 | 0 | 1 | 1 |
| 33 | 0 | .75 | 1 |
| | | | |
| Subject Three | | | |
| Question number | Pre-test | Mid-Test | Post-Time |
| 6 | 0 | 1 | 1 |
| 35 | 0 | 1 | 1 |
| | | | |
| Subject Five | | | |
| Question number | Pre-test | Mid-Test | Post-Time |
| 18 | 0 | .25 | 1 |
| 28 | 0 | 1 | 1 |
| | | | |

| Subject Six | | | |
|-----------------|----------|----------|-----------|
| Question number | Pre-test | Mid-Test | Post-Time |
| 9 | 0 | 0 | 1 |
| 20 | 0 | .25 | 1 |
| 36 | 0 | .25 | 1 |
| 37 | 0 | .75 | 1 |
| Subject Eight | | | |
| Question number | Pre-test | Mid-Test | Post-Time |
| 11 | 0 | 1 | 1 |
| 30 | 0 | 1 | 1 |
| 40 | 0 | .25 | 1 |
| Subject Nine | | | |
| Question number | Pre-test | Mid-Test | Post-Time |
| 21 | 0 | 1 | 1 |
| 23 | 0 | 1 | 1 |
| 26 | 0 | 1 | 1 |
| 32 | 0 | 1 | 1 |
| Subject Ten | | | |
| Question number | Pre-test | Mid-Test | Post-Time |
| 5 | 0 | 1 | 1 |
| 10 | 0 | .75 | 1 |
| 16 | 0 | 1 | 1 |
| 19 | 0 | 1 | 1 |

APPENDIX O

ACTIVITIES BOOK TITLES

- Bell, V., Troxel, D., Cox, T., & Hamon (2004). *The best friends book of Alzheimer's activities*. Baltimore, MD: Health Professions Press, Inc.
- Brush, J. A., & Camp, C. J. (1999). *A therapy technique for improving memory: Spaced retrieval*. Beachwood, OH: Menorah Park Center for Senior Living. (translated into Greek and Japanese as of Oct., 2009).
- Brush, J., Fleder, H., & Calkins, M. (2012). *Using the Environment to Support Communication and Foster Independence in People with Dementia: A review of case studies in long-term care settings*. Kirtland, OH: I.D.E.A.S., Inc.
- Camp, C. J. (Ed.). (1999). *Montessori-based activities for persons with dementia: Volume 1*. Beachwood, OH: Menorah Park Center for Senior Living. (translated into Spanish, Greek, Korean, Japanese, and Mandarin as of October, 2009)
- Camp, C. J., Schneider, N., Orsulic-Jeras, S., Mattern, J., McGowan, A., Antenucci, V. M., Malone, M.L. & Gorzelle, G. J. (2006). *Montessori-based activities for persons with dementia: Volume 2*. Beachwood, OH: Menorah Park Center for Senior Living.
- Forest Pharmaceuticals, Inc. (2005). *The Alzheimer's activities guide*. Jersey City, NJ
- Joltin, A., Camp, C. J., Noble, B. H., & Antenucci, V. M. (2005). *A different visit: Activities for caregivers and their loved ones with memory impairment*. Beachwood, OH: Menorah Park Center for Senior Living

APPENDIX P

MMSE STATISTICS

Table P1. Test of Normality

| Test | Statistic | df | Significance |
|-----------|-----------|----|--------------|
| Pre-Test | .86 | 8 | .11 |
| Mid-Test | .90 | 8 | .32 |
| Post-Test | .90 | 8 | .30 |

Note. The Shapiro-Wilk Test of Normality significance column does not contain any values of .05 or below. ($p > .05$). The MMSE data obtained for the pre-test, mid-test and post-test is normally distributed.

Table P2. Mauchly's Test of Sphericity: Measure: MMSE Scores

| Within Subjects Effect | Mauchly's W | Approx. Chi-Square | df | Sig. | Greenhouse-Geisser | Huynh-Feldt | Lower-bound |
|------------------------|-------------|--------------------|----|------|--------------------|-------------|-------------|
| Time | .60 | 3.1 | 2 | .22 | .71 | .85 | .50 |

Note. Mauchly's Test of Sphericity determines if the variance of differences is equal. The significance level is .22. The test for sphericity is not significant ($p > .05$). The variances of the differences are equal. $X^2 (2) = 3.1, p = .22$.

APPENDIX Q

FLCI STATISTICS

Table Q1. Test of Normality

| Test | Statistic | df | Significance |
|-----------|-----------|----|--------------|
| Pre-Test | .82 | 8 | .05 |
| Mid-Test | .87 | 8 | .16 |
| Post-Test | .82 | 8 | .05 |

Note. The Shapiro-Wilk Test of Normality significance column does contain values of .05 or below. ($p < .05$). The pre-test significance was .05 and the post-test was .05. The FLCI data obtained for the pre-test and post-test is not normally distributed.

Table Q2. Mauchly's Test of Sphericity: Measure: FLCI Scores

| Within Subjects Effect | Mauchly's W | Approx. Chi-Square | df | Sig. | Greenhouse-Geisser | Huynh-Feldt | Lower-bound |
|------------------------|-------------|--------------------|----|------|--------------------|-------------|-------------|
| Times | .94 | .39 | 2 | .82 | .94 | 1.00 | .50 |

Note. Mauchly's test of sphericity indicated the variances of the differences are equal, $X^2(2) = .386, p = .824$

APPENDIX R

FORTY QUESTIONS TEST SCORE STATISTICS

Table R1. Test of Normality for the Forty Question Test Scores

| Test | Statistic | df | Significance |
|-----------|-----------|----|--------------|
| Pre-Test | .90 | 8 | .26 |
| Mid-Test | .86 | 8 | .12 |
| Post-Test | .88 | 8 | .21 |

Note. The Shapiro-Wilk Test of Normality significance column does not contain any values of .05 or below. ($p > .05$). The Forty-Question Test Score data obtained for the pre-test, mid-test and post-test is normally distributed.

Table R2. Mauchly's Test of Sphericity for the Forty Question Test Scores:
Measure: FLCI Scores

| Within Subjects Effect | Mauchly's W | Approx. Chi- Square | df | Sig. | Greenhouse- Geisser | Huynh- Feldt | Lower- bound |
|------------------------------|----------------|---------------------------|----|------|------------------------|-----------------|-----------------|
| Times | .30 | 7.40 | 2 | .03 | .586 | .63 | 5.00 |

Note. Mauchly's Test of Sphericity determines if the variance of differences is equal. Indeed, the test of sphericity is significant ($p < .05$). The differences are not equal. Mauchly's test indicated that sphericity had been violated, $X^2(8) = 7.371$, $p = .025$. The Greenhouse-Geisser value is used to apply a correction to the data.