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Original Research Article

Development of a Memory Clinic for Older Adults: Promoting Productive Aging

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ABSTRACT

The elderly population is steadily increasing and is expected to continue rising, making it necessary for healthcare professionals to be prepared to work with and treat conditions that are prevalent among this group of individuals. Dementia is among the most prominent of these health concerns, affecting 6.8 million individuals in 2013. Dementia and other cognitive impairments can lead to significant activity limitations and participation restrictions in all aspects of life, potentially compromising safety, health, and well-being. Many individuals who are diagnosed with dementia experience an interference with their activities of daily living, which are performance areas that fall into the OT scope of practice. Medications typically used to treat dementia, are known to have harsh side effects. Fortunately, the brain has a quality called neuroplasticity, which means that the potential for learning continues to exist at any age. A memory clinic was established to determine if cognitive training can prevent, maintain, and restore cognitive function.

Key words: occupational therapy, dementia, Alzheimer's, geriatric, cognitive training.

INTRODUCTION

Over the past few decades, there has been a steady rise in the number of people within the elderly population, due to the baby boom generation. Due to this drastic increase in elderly individuals, there has also been an increase the prevalence of dementia and other cognitive deficits associated with aging diagnoses. There are many forms of treatment available that attempt to combat this process of cognitive decline, one of which is a memory clinic used by occupational therapists. Other studies have shown the promise for a long-lasting neuroplastic effect within the aging population's brain, showing a propensity for increased cognitive function. This prospect of increased cognition can translate over to other areas of daily living and can ultimately lead to an increased quality of life. Currently, literature is lacking in regards to the success of various cognitive treatments. For example, it is important to note the harsh side effects that medications can lead to, including inefficiency associated with anticholinergics, which have lead to a decline in cognitive functions (Antai-Otong, 2003 & Chatterjee, Mehta, Sherer, & Aparasu, 2004). The purpose of this study is to discover if cognitive training can prevent, maintain, and restore cognitive function through neuroplasticity achieved via improved scores on cognitive assessments amongst the elderly population.

The number of people aged 65 and over has been steadily growing in the United States as the baby boomer generation is reaching late adulthood. As of the 2010 census, there are roughly 40 million people aged 65 and older and it is projected to more

than double by 2050 (U.S. Census Bureau, 2010, p. 5). Globally, it is estimated that the number over age 60 will increase by 1.25 billion and make up 22% of the world's population by 2050 (Prince, Bryce, Albanese, Wimo, Ribeiro, & Ferri, 2013, p.64). Therefore, health concerns and conditions affecting the elderly population are becoming more recognized and studied. Prominent among these concerns, is the prevalence of dementia and other cognitive disorders.

"Population aging is having a profound impact on the emergence of the dementia epidemic, and is driving government responses" (Prince et. al., 2013, p.64). Programs have been started and new strategies continue to be formed to combat dementia in countries such as the United States, United Kingdom, France, Norway, and South Korea (Prince et. al., 2013, p.64). An international study of the regions in the World Health Organization revealed that in 2005, 24.3 million people had dementia worldwide (Ferri, Prince, Brayne, Brodaty, Fratiglioni, Ganguli, Hall, Hasegawa, Hendrie, Huang, Jorm, Mathers, Menezes, Rimmer, Scazufca, & Alzheimer's Disease International, 2005, p.2112). Every year beyond 2005, 4.6 million new cases of dementia will appear with an average of "one new case every 7 seconds" (Ferri et. al., 2005, p.2112).

"The U.S. Congress Office of Technology Assessment estimates that as many as 6.8 million people in the United States have dementia, and at least 1.8 million of those are severely affected" (National Institute of Neurological Disorders and Stroke, 2013). As a developed country, the rate of dementia in the United States is expected to increase by 100% between 2001 and 2040 (Ferri et. al., 2005, p.2112). Currently, at least 360,000 people are diagnosed every year (National Institute of Neurological Disorders and Stroke, 2013). Although it is becoming a common occurrence in the elderly population, dementia is not a part of normal aging. About 50,000 people are reported to die from it each year (National Institute of Neurological Disorders and Stroke, 2013).

Data for the memory clinic was gathered from a targeted elderly population residing at the Mercy Center Nursing Unit in Dallas, Pennsylvania. Compared to every other state, Pennsylvania ranks fourth, when measuring, population aged 65 or older. Luzerne County in particular, which Dallas is a part of, has a higher number of elderly citizens. Senior citizens make up 16.0% of Pennsylvania's population and 18.4% of Luzerne county's (U.S. Census Bureau, 2013).

Occupational therapists work with a variety of people, including elderly with dementia or cognitive deficits. They work with these clients in a variety of setting including "hospitals, institutions, communities, nursing homes, day centers, geriatric treatment facilities, outpatient memory clinics, and in the person's home" (Baldelli, Boiardi, Ferrari, Bianchi, & Hunscott, 2007 & Bennett, Shand, & Liddle, 2011). "The purpose of occupational therapy (OT) intervention applied to persons with dementia is to maintain and enhance the ability to perform activity of daily living (ADL), and allow persons to participate in social activities (Kim, Yoo, Jung, Park, & Park, 2012).

The importance of utilizing OT concerning individuals with dementia, particularly regarding activities of daily living, determines improved patient performance. This is accomplished through repetitive functional tasks which lead to a consolidation of abilities, improving the patient's level of autonomy (Baldelli, et al., 2007).

> "It also aims at improving quality of life and reducing the burden of caring. Occupational therapists apply activity analysis, caregiver training, sensory stimulation, behavior control skill teaching, physical and social environmental modification, cognitive training, and purposeful activity. Emotional status such as

> depression, anxiety, and apathy, instrumental activity of daily living (IADL), memory and cognitive function, quality of life, behavioral problems, burden of caring and sense of competence of caregivers have been used as variables to measure the effect of OT interventions" (Kim et al., 2012).

OT's should be partaking in various endeavors to ensure that people with dementia are receiving proper care. "Research literature [reports] that the quality of care within residential facilities could be improved" (O'Sullivan, 2013). When assessing clients with dementia, OT's should make sure that there is "information not only about current cognitive status but also information about how changing the task, level of cueing, and environmental demands can assist in compensating for the cognitive deficits and help in managing and maintain function as long as possible" (Erez & Katz, 2003). One way OT's can improve the lives of people with dementia is by incorporating cognitive interventions and programs.

> "A randomized control trial (RCT) found community occupational therapy sessions that included cognitive and behavioural interventions for individuals with mild to moderate dementia to be associated with improved functioning in daily activities, reduced caregiver burden and a higher effects size in comparison with drug trials or other psychosocial interventions" (Yuill & Hollis, 2011).

"A good activity programme has three important factors: physical exercise, mental challenges and social activities" (O'Sullican, 2007). "Engaging individuals in such programs has the potential to play an integral role in striving towards the achievement of therapeutic goals for this population" (Yuill & Hollis, 2011). "Research by Gitlin et al. (2008) has further demonstrated the importance of using individualised activity for improving cognitive performance, increasing independence in everyday tasks and reducing caregiver burden" (Bennett, Shand, & Liddle, 2011). "Therefore… even with patients with dementia… it is possible and it becomes important to try to recuperate residual functional capacities utilizing OT programs in order to guarantee the highest level of autonomy possible" (Baldelli et al. 2007).

A study done by Terada, Oshima, Yokota, Ikeda, Nagao, Takeda, Sasaki and Uchitoma (2013) reviewed personal care and quality of life by giving surveys to over 200 geriatric clients that lived in either a hospital or geriatric health care facility. The study concluded that the type of care received by clients with dementia in the facility was related to the perceived quality of life by the same clients. Clients with dementia who gave lower scores of perceived personal care also gave lower scores on the quality of life survey (Terada et. al, 2013). Health care professionals providing care for elderly clients with dementia may not understand the importance of quality of life.

A study completed by Nakanishi, Hanihara, Mutai, and Nakaaki (2011), analyzed the perception of quality of life for both clients with dementia and accompanying staff members working in nursing healthcare facilities. The results showed that quality of life perception was significantly different between clients and staff members. An analysis done in this study linked quality of life perception by staff members with dementia severity and behavior symptoms. For clients with dementia, quality of life was linked with functional status and depression. Overall, this study suggests that staff members underestimate the quality of life perception of clients (Nakanishi, Hanihara, Mutai, & Nakaaki, 2011).

Similarly, another study was completed to understand the quality of life of clients living with dementia in residential healthcare facilities. The data in the study

was collected through the use of observation and interviews. Some of the interviews were completed by staff members if the client was unable to at the time. Results from this study showed that the staff member's perception of quality of life for the client was related to the amount of dependency that the client needed. The study suggests that the staff members did not try to view the subjective experiences of the client and instead focused on how functionally disabled the client was (Hoe, Hancock, Livingston & Orrell, 2006). Staff members and health care professionals prove to have a direct link on how clients with dementia view quality of life. Whether staff member perception is invalid or staff member care is improper, quality of life remains a key factor that is affected for elderly clients living with dementia in health care facilities.

To further support research on how staff members' interactions affect clients, a study was done to determine if staff member education would improve the lives of the clients living in the corresponding healthcare facility. The study proved that education provided to the staff members by an occupational therapist improves quality of life for clients (Makoutoninaa, Ianseka, & Simpson, 2010). Cognitive deficits such as Alzheimer's and dementia can lead an elderly person, as well as their caregiver, to have a poor quality of life perspective. A study completed by Fischera, Ismail, and Schweizer measured how delusional symptoms from being diagnosed with Alzheimer's disease can impact both the lives of the caregiver and client. Results from this study indicated that functional decline of the client was highly correlated with increased caregiver burden and delusions from the client. Delusions caused clients to have a slightly decreased quality of life as compared to clients without delusions. This study revealed that quality of life measurements from clients are not always consistent because a cognitive deficit such as Alzheimer's impairs executive judgment (Fischera, Ismail, & Schweizer, 2012). Quality of life for clients with dementia living in geriatric health care facilities is an important research factor due to the limited amount of occupations in which clients can participate. A study on how to improve quality of life for clients with a cognitive deficit was experimented through the use of a cognitive stimulation program. The results from the study using a cognitive stimulation program with elderly clients improved overall quality of life (Fernandez-Prado, Conlon, Mayan-Santos, & Gandoy-Crego, 2012).

There are various treatment options available for the elderly population with deficits in cognition or progressive cognitive decline. Some of the focus on treatment with this subset is the concentration on different strategies for learning or re-learning to occur, alternative therapies such as music therapy, and the management of medications to slow the progression of cognitive decline. Each facet of therapy has something to offer for the patient struggling with cognitive deficits in occupational functioning.

Pharmacological treatment options include, Acetyl cholinesterase inhibitors, which have been a predominant treatment for Alzheimer's disease over a decade ago, but have since received notable disagreement in its appropriateness for positive outcomes (Antai-Otong, 2003 & Chatterjee, Mehta, Sherer, & Aparasu, 2004). These medications "consist of drugs from a wide range of therapeutic categories, including oxybutynin, atropine, and benzatropine" and are used with medical diagnoses such as "Parkinson's disease, irritable bowel syndrome, and urinary incontinence" (Chatterjee, Mehta, Sherer, & Aparasu, 2004, p. 988). Other medications such as antidepressants, antipsychotics and antihistamines with anticholinergic properties often produce unwanted and unwarranted side effects that affect patients with cognitive decline occupational functioning (Chatterjee et al., 2004).

Anticholinergic medications work by a mechanism of action that seeks to slow down the progression of the disease by

attempting to delay the degradation of acetylcholine, an important neurotransmitter that is responsible for many actions in memory and learning. However, many of these medications produce unwanted side effects. Patients with dementia suffer from break down of the "cholinergic neurons system," and adverse affects of medications can exacerbate cognitive decline and functioning.

With particular attention to extraneous adverse effects such as "dry mouth, constipation, urinary retention/ hesitation, visual impairment and central adverse affects including falls, confusion, cognitive impairment, sedation and delirium," it is hard to deny the potential inappropriateness of their use with the elderly (Chatterjee et al, 2004, p. 988). A definitive diagnosis of dementia, the dosage of anticholinergic medications, and the mechanism of action of anticholinergic agents are of particular concern for patients with dementia due to the central adverse affects, namely delirium and cognitive impairment that may further impact occupational functioning and quality of life (Chatterjee et al., 2004).

Due to numerous adverse effects of medications and the difficulties present with pharmacological management of symptoms, other approaches such as psychotherapeutic approaches have been implemented to treat patients with dementia and other diseases with progressive cognitive decline. Some of the more notable psychotherapeutic agents used in treatment include music therapy, cognitive training, and reminiscence therapy to promote positive cognitive and global functioning outcomes (Hopper, Bourgeois, Pimentel, Qualls, Hickey, Frymark, & Schooling, 2013). Many of these therapies have had an influential impact on patients with dementia in "multiple domains of outcomes, including cognition, activities of daily living (ADLs), behavior, mood, and time to institutionalization" (Hopper et al, 2013, p. 127).

Cognitive training principles allow patients with mild to moderate cognitive decline to learn and relearn particular facts and procedures, while music therapy, "provides the opportunity to express feelings, enhancing independence and self-esteem, decreasing isolation, agitation, anxiety and apathy, addressing the patient as an individual with specific needs (Weber, Meiler-Mititelu,Herrmann, Giannakopoulos, Canuto, 2009, p. 93). Often these alternative therapies are used to encourage therapeutic support and continually strengthen the neuronal pathways needed for learning and memory retention to occur.

"Memory, a spectrum of cognitive functions inextricably coupled to everyday function, is associated with increasing concern among the aging population, and memory complaints are reported by up to 50% of adults aged 64 and over" (Engvig, Fjell, Westlye, Moberget, Sundseth, Larsen, & Walhovd, 2010, p.1667).

Although cognitive decline is a very predominant issue amongst the elderly population, according to Engvig et. al (2010), "accumulating evidence suggests that the brain's potential to adapt and change is life-long…suggesting intact neuroplasticity in advanced age" (p.1667). If what these statements suggest are true, then the question becomes what services can healthcare professionals provide in order to prevent cognitive decline in the elderly population?

Many studies have suggested that instituting a memory clinic with the well-elderly as a form of primary prevention could slow the advancement of cognitive decline in the future. For example, in a study conducted by Cavallini, Pagnin, and Vecchi (2003), mnemonic training was used because "the aim of memory training is to teach the ideal use of memory strategies in different everyday situations in order to improve performance" (p.253). As OT's, being client-centered through the use of occupations is the epitome of the OT profession, therefore the idea that "the possibility of improving everyday life through memory training is related to the possibility of extending the strategies to

other materials or contests, and in association, to selecting the most efficient strategy in different contexts" (Cavallini, Pagnin, & Vecchi, 2003, p.253) is an amazing prospect. This idea is also demonstrated through The Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) trial by Willis, Tennstedt, Marsiske, Ball, Elias, Koepke,…& Wright (2010) which examines the long-term effects of cognitive interventions on the independent elderly population. This study found that speed processing, mnemonic and reasoning "training effects could reflect real benefits of intervention because each of the 3 trained cognitive abilities has been associated with everyday functioning" (Willis et. al, 2010, p.2811).

Secondary prevention strategies can also slow the process of cognitive decline. Lee, Lee, and Hwang studied Computer-Aided Cognitive Rehabilitation (CACR). The users were able to adjust the level of difficulty based on their level of cognition. "CACR training addresses different domains such as visual reaction, visual scanning, attention, information-processing speed, memory, and problem-solving ability" (Lee, Lee, & Hwang, 2012, p.885). It was reported that "another study conducted a four weeks of CACR training for brain-damaged patients with cognitive impairment reported that the experimental group's short-term language memory, short-term visual memory, auditory and visual attention, and concentration improved significantly relative to the control group" (Lee, Lee, & Hwang, 2012, p.887).

Optale, Urgesi, Busato, Marin, Piron, Priftis,… & Borden (2010) conducted a study using virtual reality memory training (VRMT) in people aged 65 or older with the presence of memory deficits. "We measured the effects of the treatments on general cognitive abilities, verbal memory, executive functions, and visuospatial processing by administering a series of neuropsychological tests" (p.351). Findings showed "an improvement of general cognitive functioning and verbal memory after the initial training phase. The largest effects were observed in long-term memory" (Optale et. al, 2010, p.355). This generalization can be further explained via "hypothesizing that the VRMT boosted focused attention, that is, the ability to concentrate and selectively respond to one specific visual, auditory, or tactile stimulus; to one aspect of the stimulus; or to a specific spatial location while ignoring others" (Optale et. al, 2010, p.355). The ultimate effects of this being that, "attention abilities may decline in elderly adults and in patients suffering from AD, causing ineffective processing and memorization of sensory stimuli" (Optale et. al, 2010, p.355). What can be deduced from the beneficial effects of computer games which included "improved performance…in different attentional and perceptual abilities, including visual attention, attentional capture, and visual contrast sensitivity" (Optale et. al, 2010, p.355), is that memory games and forms of cognitive stimulation, including word searches, crossword puzzles, mazes, etc, can combat the progression of cognitive decline. Nouchi, Taki, Takeuchi, Hashizume, Akitsuki, Shigemune,…& Kawashima (2012) even conducted a study that focused on using the game "Brain Age" and they found that the use of games as a form of cognitive training and memory fitness "that there is a possibility which the elderly could improve executive functions and processing speed in short-term training" (p.6).

Overall, research supports the use of OT with cognitive interventions to improve the quality of life in elders with dementia. Studies have shown improvements in the functional abilities and overall health of these individuals, which leads to more independence and life satisfaction. OT's should continue with the use of cognitive interventions to further improve the lives of these individuals.

MATERIALS AND METHODS

Participants included in this study were recruited via addressed letter sent to the Mercy Center in Dallas, PA, requesting participants to join the "Memory Clinic" study. Participants were screened for eligibility and inclusion/exclusion criteria. Participants were included in the study if they were at least 65 years of age, resided at the Mercy Center, demonstrated or have a diagnosis of cognitive decline (Alzheimer's Dementia, etc.,), are either a male or a female, and of any religious, ethnic, socioeconomic, or racial background. Participants were excluded from the study if, as in one case, one participant demonstrated too significant of a cognitive decline to engage in the tasks and computer activities presented by the researchers. Participants were also excluded if they had a significant visual or motor impairment that might interfere with the study procedures; however these skills were assed to determine whether or not adaptations could be provided. Sixteen participants were selected by the researchers to be included in the study.

This study received institutional review board approval from Misericordia University, and participants provided informed consent. The "Memory Clinic" was conducted at the Mercy Center in Dallas, PA, within the computer/activities room. For the purposes of this study, a within subject, pre-test and post-test design was used to determine if engaging in cognitive tasks can prevent, maintain, or restore cognitive functioning.

Participants were screened for degree of cognitive impairment using the Montreal Cognitive Assessment (MoCA), and the St. Louis University Mental Status exam (SLUMS). The researchers guided participants through a series of pencil and paper cognitive training exercises, including word searches, word association focused on similarities and differences, word scramble, alphabet soup, matching, crosswords, mathematic computation, and sequencing. Participants were given thirty minutes to complete these pencil and paper cognitive training exercises for cognitive stimulation. After 6 weeks, all pencil and paper activities were re-administered to determine any improvement in performance.

Using the Brainiversity software, participants were able to track individual progress through a series of interactive games and challenges. Participants engaged in these cognitive tasks via a "Daily Examination" two times each week, for the entire twelve weeks span of the study, each session being facilitated by at least two members of the research team.

After completion of the twelve weeks of enrollment in the "Memory Clinic," participants were again evaluated using the Montreal Cognitive Assessment, and the St. Louis University Mental Status exam, to determine if any there were any changes in results. Data collected from the Brainiversity software was also used to track participants' progress throughout program implementation. No financial or physical reward for the participants' contribution was provided. Cognitive functioning was analyzed using a one-way analysis of variance (ANOVA) comparing performance on the MoCA and SLUMS, pre-"Memory Clinic" implementation, and post-implementation.

RESULTS

In terms of improvements in scoring between the St. Luis University Mental Status Exam, and the Montreal Cognitive Assessment, three participants' scores decreased at the Montreal Cognitive Assessment post-programming implementation. All participants' scores increased on the post-evaluation measure of the St. Louis University Mental Status Exam, and most participants' scores increased by more points on the SLUMS assessment than the MoCA. A T-Test analysis of the SLUMS yielded a pre-test mean of 17.6, and a post-test mean of 21.6, which was significant, t=-3.802, p= .007. While, the MoCA presented with a pre-test

mean of 19.6 and a post-test mean of 20.4, which was not significant, t= 1.210 p= .265.

After completing a Pearson Correlation to determine a correlation between the two assessments, the research team found there was a "one way correlation" between the MoCA, and the SLUMS. This suggested that when scores increased on one assessment measure, scores on the other should also increase. This "one way correlation" was significant in both the pre- and post-testing measures on the Montreal Cognitive Assessment and the St. Louis University Mental Status exam. The results show that a clinic utilizing cognitive training exercises can maintain and/or restore cognitive functioning.

DISCUSSION

The program provided participants the opportunity to engage in a non-pharmacological approach to a healthy mind. Participants in the program were offered activities that may prevent or slow the cognitive decline that is associated with the aging process, maintain their current level of brain functioning, and/or enhance skills they may have lost, ultimately resulting in improved quality of life. The results yielded from this research study are consistent with current evidence on primary, secondary, and tertiary intervention methods that utilize cognitive training exercises. The results from this study are also synonymous with current evidence on "neuroplasticity" suggesting the brains potential to adapt is lifelong.

The results of this study should be interpreted with some caution. Firstly, while 16 participants were recruited, only 8 participants were included at the final analysis of the program implementation, and may not be fully representative of older adults with cognitive decline. This smaller sample size affects the generalization of cognitive training exercises to this population. Other limitations of lacking a control group for comparison limit the extensibility and validity of the program where only one group (participants) were compared against themselves within the pre/post-test design. Other limitations, such as variations among participants in baseline cognitive functioning, affected overall performance on the cognitive training exercises. For example, one participant was excluded from the study analysis due to significant cognitive impairment that prevented the participant from engaging in the activities and feeling successful. Limitations related specifically to the pre/post-testing design include, carryover effects such as the practice effect or the fatigue effect. The practice effect might have influenced participants positively, that performance on the pre-test measures positively influenced performance on the post-test measures. While the fatigue effect may also have influenced performance, some participants saw decreases in their scores between the post-test measures and the pre-test measures.

CONCLUSION

Due to the severe impact memory impairments can have on function, it is important to educate the well-elderly and those in the early stages of cognitive decline and memory impairment on prevention and preservation techniques that can help them to maintain their quality of life as they age.

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