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ASSOCIATION OF DELIRIUM AND PHYSICAL FUNCTION TO ENGAGEMENT IN COGNITIVELY STIMULATING ACTIVITIES IN PATIENTS WITH DELIRIUM SUPERIMPOSED ON DEMENTIA

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ABSTRACT

Background: Delirium superimposed on dementia (DSD) occurs when an individual with a pre-existing dementia develops delirium. Delirium, a state of confusion with acute onset and fluctuating course, is common and deadly in older adults with dementia. There is no widely accepted intervention for delirium, but preliminary evidence indicates that cognitive stimulation may hold promise for resolving some of the cognitive impairments associated with delirium. In this study, we were interested in determining factors, functional status and delirium in the presence of dementia, that are associated with the ability of patients with DSD to engage in cognitive activities.

Purpose: To assess the association of delirium and functional status in the presence of dementia to the ability of patients with DSD in post-acute care to engage in cognitively stimulating activities in each cognitive domain

Methods: This study is a secondary analysis of a randomized clinical trial testing the effect of interventions in people with DSD. The present study included 141 participants of the intervention group. Each participant received a daily 30-minute session of recreational activities for up to 30 days. The activities involved five cognitive domains and were tailored based on individuals' interest. Data on participants' level of delirium, level of physical function, and level of activity engagement were collected. Descriptive statistics and bivariate correlations were used to examine the association of delirium and physical function to the engagement of activities completed in each cognitive domain respectively.

Results: Participants were 85 years of age on average and predominantly white (96.5%). They had mild to moderate delirium and poor physical function. A small negative, yet statistically significant relationship between delirium and the number of activities attempted was found (r= -

0.22, p< 0.0001); however, physical function and number of activities attempted are not significantly related in this sample.

Conclusion and Implications: This study revealed that level of delirium is associated with engagement of cognitively stimulating activities – the more severe the delirium, the less activity engagement. However, the level of physical function was not found to be associated with activity engagement. These findings will help guide intervention design for people with DSD. Specifically, interventions for DSD may need to be tailored based on individuals' severity of delirium. Individuals' physical function does not impede their capacity to carry out cognitively stimulating activities.

Keywords: delirium superimposed on dementia, activities, delirium, physical function

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Chapter 1

Introduction

According to the *Diagnostic and Statistical Manual of Mental Disorders,* fifth edition, (DSM-5) (American Psychiatric Association [APA], 2013), dementia is defined as a significant cognitive decline from a previous level of performance in one or more cognitive domains to an extent sufficient to interfere with independence in activities of daily living (ADLs). Dementia patients have objective evidence for disease of the brain in some form, such as neurofibrillary tangles in Alzheimer's disease or multiple strokes causing vascular dementia (Miller, 2009). In contrast to dementia, delirium is an acute change in mental status with features of inattention, disorganized thinking, and a disturbance in cognition, all of which fluctuate during the course of the day (APA, 2013). The American Delirium Society (2013) states that more than 7 million hospitalized Americans suffer from delirium each year.

Delirium is superimposed on dementia (DSD) when an acute change in mental status is layered on top of preexisting dementia (Fick & Foreman, 2000). Research indicates that up to 89% of older adults with dementia experience delirium at some time during a hospital stay (Fick, Agostini, & Inouye, 2002). These hospitalized DSD patients have a more than twofold increased risk of mortality in the 12 months following discharge than do patients with dementia or delirium alone (Bellelli et al., 2007). Management of DSD is important because research suggests that older adults whose delirium never resolves, regain less than 50% of their pre-hospital functioning, whereas resolution of the delirium is likely to lead to a full recovery in the post-acute care stage (Kiely et al., 2006). These same clinical issues can be extrapolated to the post-

acute care patient, as delirium often persists for an extended period of time into the post-hospital period (Kolanowski, Buettner, Fick, Fitzsimmons, & Cornacchione, 2008).

There are many different ways to treat DSD, with both pharmacologic and non-pharmacologic interventions. There is growing evidence that cognitively stimulating activities improve overall function in older adults with mild-moderate stages of dementia (Kolanowski et al., 2008), indicating that use of cognitive stimulating recreational activities, such as puzzles, crosswords, and game play, may be used as a treatment plan to help resolve DSD. Using such drug free therapeutic modalities tailored to individual interests can facilitate processing in the five cognitive domains affected by delirium: 1) attention (the primary neuropsychological deficit), 2) orientation, 3) memory, 4) abstract thinking, and 5) executive functioning (life task management) (Wacker, Nunes, Cabrita, & Forlenza, 2005). Deficits in these various domains are accountable for cognitive decline perceived in delirium, and as improvements in these areas occur, the inconsistent course typical of delirium often stabilizes and resolves (Fick & Foreman, 2000).

The changes in cognition that accompany delirium are paralleled by deficits in physical function, associated with ADLs (Fick et al., 2002). The impairments in attention so indicative of delirium leads to impaired memory performance, thus compromising ADLs. Individuals who experience the acute cognitive problems associated with delirium are likely to experience difficulties with continence, ambulation, and dressing, among other functional tasks (Kiely et al., 2006). Therefore, restoration of cognitive function is apt to be accompanied by improvement in physical function as the superimposed delirium resolves.

Problem

The significant morbidity and mortality associated with delirium necessitates the search for potentially correctable precipitating factors such as infections, medication side effects, or sensory impairment (Fong, Tulebaev, & Inouye, 2009). While this evaluation is ensuing, untoward behaviors associated with a decompensated state of delirium often need to be treated. Clinical experience suggests that physicians often prematurely prescribe benzodiazepines or even antipsychotics to manage the neuropsychiatric symptoms of delirium and/or dementia before an underlying etiology is determined. According to Alanen, Finne-Soveri, Noro, and Leinonen (2006), these medications can alleviate the difficult behaviors that accompany confused states, such as changes in mood, repetitive speech, and decreased memory. However, pharmacological interventions should not be the first line of treatment, as there is an indication that these medications can actually precipitate or exacerbate a delirium (Fong et al., 2009). In fact, many of the antipsychotic drugs come with a black box warning of an increased mortality risk associated with their use, requiring informed consent before administration (Lilley, Collins, & Snyder, 2014). With such a vulnerable population, it is crucial to develop a gold standard treatment for DSD. While cognitively stimulating activities seem promising to manage DSD, it is unclear whether DSD patients can perform these types of activities due to the impairment of cognitive function and physical function associated with delirium and dementia. Therefore, it is important to establish the potential of such safe, efficacious non-pharmacological treatment.

Purpose

The purpose of this study was to conduct a secondary data analysis assessing the relationship of delirium and physical function with engagement in cognitively stimulating recreational activities in the context of DSD in older adults (greater than 65 years old) in a post-acute care setting. The following research questions were explored: 1) In older adult patients with DSD, what is the association between delirium and engagement in cognitively stimulating activities overall and in each cognitive domain? 2) In older adult patients with DSD, what is the association between physical function and engagement in cognitively stimulating activities overall and in each cognitive domain?

Chapter 2

Review of the Literature

This section will review literature on dementia and delirium in older adults, the impact of DSD on cognitive and functional status, and identify current evidence regarding non-pharmacological treatments and specifically cognitively stimulating activities in the management of DSD.

A literature search was performed using the MEDLINE (PubMed) database and Google Scholar to identify publications. Limits were originally set to include articles dating back no more than ten years, but the search was extended by review of reference lists from pertinent original reports of data for other relevant studies and consultation with experts. In addition, the search was limited to peer-reviewed primary research studies and systematic reviews, published in English and including human participants. To help focus the search, keyword terms were used, which include: delirium, delirium superimposed on dementia, activity or games or recreational activity, function or functional status, and older adult or elder. Articles were reviewed for relevance and excluded first by title, then by abstract review, and finally by full text review. A literature tree (Appendix A) displays the number of articles originally excluded in each phase of review.

Dementia and Delirium in Older Adults

Dementia is a chronic, progressive disorder of brain activity and function resulting in cognitive impairment (APA, 2013). It is a gradual process that often begins with problems in short term memory and difficulty learning, which then slowly advances to disturbed cognition,

impaired language, inability to perform activities of daily living (ADLs), and ultimately death (APA, 2013; Fick et al., 2002). The rate of dementia in the United States is increasing at staggering rates. According to the Alzheimer's Association (2015), an estimated 5.2 million Americans currently suffer from dementia, and it is predicted that by 2050, 14 million older persons in the United States will have dementia. This high prevalence rate of individuals with an already altered brain function produces a large population that is at high risk of developing delirium (Fick & Foreman, 2000).

In contrast, delirium is described as an acute change in cognition, attention, and level of consciousness (APA, 2013). Although the symptoms are similar to dementia, with delirium, there is a more rapid onset of hours to days and follows a more unpredictable and changing course (Fick et al., 2002). Resolution becomes vitally important because when delirium resolves slowly or never at all, less than 50% of pre-illness functioning is realized (McCusker et al., 2001). According to Fick and Foreman (2000), delirium is associated with poor health outcomes, including urinary incontinence, restraint use, weight loss, comorbidity, and depression were much more evident in patients with delirium compared to those without presentation of delirium. As a historical reference from their research, 63% of the patients with delirium were restrained once admitted to the hospital as compared to 0% of patients without delirium (Fick & Foreman, 2000). This is consistent with the findings from another research study that found delirium is connected with prolonged hospitalization, increased likelihood of readmissions, premature nursing home placement, and increased mortality (McCusker, Cole, Abrahamowicz, Primeau, & Belzile, 2002). Such findings are troublesome, particularly when this acute change in mental status is combined in a person with dementia.

Delirium Superimposed on Dementia

Delirium in persons with pre-existing cognitive impairment of a probable dementia type is termed delirium superimposed on dementia (Fick & Foreman, 2000). Severity of dementia is the strongest clinical factor that influences the severity of delirium (Voyer, Richard, Doucet, & Carmichael, 2011). Recent literature suggests that delirium and dementia may represent points along a continuum, with delirium reflecting an underlying brain vulnerability in early stage dementia (Fick, Kolanowski, Beattie, & McCrow, 2009). The complex etiology of delirium, signifying an interaction between baseline patient vulnerability (predisposing factors) and exposure to noxious stimuli or precipitating factors, suggests that highly vulnerable patients (i.e. dementia) may develop delirium with a relatively innocuous insult (Bee Gek Tay, Chew Chan, & Sian Chong, 2013).

Studies show that delirium in people with dementia have significantly greater levels of disturbance of consciousness and impairments in all cognitive domains, compared to patients with delirium alone (Boettger, Passik, & Breitbart, 2009). Depending on the setting, diagnostic criteria, or research methods, the prevalence of DSD ranges from 22% to 89% of hospitalized and community populations aged 65 and older (Fick et al., 2002). Also of concern, McCusker and colleagues (2002) depicted that, within a controlled setting, 74% of patients with DSD died within the 12-month period of the study compared to 24% of the patients who had only dementia as a diagnosis. In support of these findings, a similar study later showed that elderly individuals with DSD have a more than twofold increase risk of mortality within one year than do elderly patients with dementia or delirium alone (Bellelli et al., 2007). These disturbing outcomes highlight the need for follow-up and further study in this area to examine and develop plans of management of delirium in older adults with dementia.

Cognitive and Functional Impairment in DSD

Delirium has been shown to be an independent predictor of cognitive and functional status decline. The primary neuropsychological deficit responsible for cognitive decline in delirium is in the domain of attention, while orientation, memory, abstract thinking, and executive function are also affected (Wacker et al., 2005). The changes in cognition that accompany delirium are paralleled by deficits in physical function, associated with ADLs (Fick et al., 2002). This loss of functional independence is a serious complication of delirium, with functional consequences often persisting long after the index hospital admission (Kolanowski et al., 2008; McCusker et al., 2001). The total health care costs associated with delirium were recently estimated at up to $152 billion a year (Leslie & Inouye, 2011). Given that patients with dementia recovering from delirium have comparable potential for functional recovery as their cognitively intact counterparts (Bee Gek Tay et al., 2013), treatment plan is essential for people with DSD.

Treatments of Delirium

To combat the cognitive and functional decline that accompany delirium, strategies of management include pharmacologic and non-pharmacologic interventions. For the purpose of this literature review, pharmacological management of delirium is reviewed to highlight the need to routinely implement non-pharmacological therapies for delirium.

Pharmacological Management

Current suggestions for pharmacological management of delirium include treating the underlying physiological mechanism of the delirium (Tahir, Morgan, & Eeles, 2011), but because of its multifactorial nature and fluctuating course, this can be challenging (Inouye, 1999). Recommendations to cautiously use certain medications such as benzodiazepines in persons at high risk of delirium have been put forth (Clegg & Young, 2011). However, this class of drugs is not suggested as first-line agents in the treatment of delirium, as there is an indication that benzodiazepines often exacerbate mental status changes and cause oversedation (Fong et al., 2009). In addition, according to the revised Beers Criteria for Potentially Inappropriate Medication Use in Older Adults, antipsychotics are associated with an increased risk of cerebrovascular accident, or stroke, and mortality in persons with cognitive impairment (Campanelli, 2012). Essentially, the use of almost any medication to treat behavioral changes can further cloud the patient's mental status and obscure efforts to monitor the course of the delirium, and therefore, should be avoided if possible (Fong et al., 2009). Due to the risk of negative consequences from use of pharmacological management of delirium in older adults, current scholarly opinion suggests that widespread adoption of drug therapies should not be the primary management tool to treat delirium (Yevchak et al., 2012), thus highlighting the urgency for non-pharmacological treatment.

Non-pharmacological Intervention

There is a compelling necessity to develop safe and cost effective non-pharmacological interventions that resolve DSD, not only for the population that is vulnerable to the effects of

current pharmacological treatments, but also to aid in a costly national burden. Prevention of delirium through non-pharmacological interventions has been examined by several studies. Often, these interventions have multiple components, utilizing interdisciplinary healthcare providers and family members to target recognized risk factors of delirium (Hshieh et al., 2015). This is important, as prevention is always a priority; however, it is often difficult to prevent delirium in this population because of their already reduced cognitive reserve (Kolanowski, Hill, Clare, & Marx, 2012). For this reason, interventions that help resolve delirium are critically needed. Unfortunately, there are few interventions that treat established DSD at the current time.

Cognitively stimulating recreational activities. The provision of cognitive and/or physical stimulation that facilitates attention is a key theoretical concept in the development of delirium interventions currently being tested (Kolanowski et al., 2010; Yevchak et al., 2012). Cognitive stimulation is a non-regimented intervention that promotes cognitive processing in order to restore cognitive function (Kolanowski et al., 2012). Many activities provide cognitive stimulation, and when designed to be personally interesting and accommodate functional skills, these activities provide intrinsic motivation for participation and help to warrant long-term involvement, a requisite for maximum benefit (Choi & Medalia, 2005).

In a pilot focus group study, researchers examined diversion and cognitive and physical activity, in which patients were given simple activities like towels to fold or magazines to read to maintain activity and engagement. Such activities were chosen to avert patients with delirium from wandering, pulling at invasive devices, and from becoming increasingly restless (Yevchak et al., 2012). In addition, there is strong supporting evidence from a study of healthy older adults by Valenzuela and Sachdev (2009) that cognitively stimulating activities were related to strong and persistent effects on long-term neuropsychological performance. This study also

demonstrated that similar improvements in cognition and daily functioning were noted in the dementia population (Valenzuela & Sachdev, 2009). Such a study may indicate that usage of these activities may be used as a treatment plan to help resolve DSD.

Through this growing evidence, Kolanowski and colleagues (2011) are examining the use of attention-capturing recreational activities as a tool to facilitate cognitive processing to manage and resolve delirium, but this study is still in progress. They are using recreational activities that are tailored to personal interests and functional abilities. Attributes of personal interests are that they focus attention, arouse feelings, and promote engagement. Kolanowski et al. (2012) cites that research has also shown that when an individual's functional skills are equal to the challenges inherent in an activity, the individual is more likely to become fully engaged, lose track of time, and experience positive emotions. Their pilot work on the development of this intervention encourages their undertaking of a larger project to improve care for people with dementia who suffer the devastating effects of delirium (Kolanowski et al., 2012).

Clinically, with delirium there is inattention, an altered level of consciousness that can range from stupor to hypervigilence and disorganized thinking. Attention is the primary neuropsychological deficit, making it a key mechanism in this syndrome (Kolanowski et al., 2012). Interventions that support skills in attention may assist in recovery from delirium. Recreational activities deliver cognitive stimulation in a very unobtrusive, enjoyable manner, making them seemingly appropriate for individuals who may not tolerate formal methods of cognitive stimulation. Still, little is known whether people with DSD can perform these cognitively stimulating activities. Overall, a minimal number of research studies exist evaluating these recreational forms of management on DSD, and thus, their efficacy remains uncertain.

Summary

DSD is a significant issue in older adults and results in negative consequences, especially on cognitive function and physical function. Although the current literature gives a baseline understanding of DSD and ways to prevent it, there is a gap in how to manage and resolve unavoidable cases. Delirium is treatable, however, for people with DSD, there is no gold standard treatment. Cognitively stimulating activities seem promising for DSD. Still, it is not clear if it is feasible to administer cognitively stimulating activities in this population given the impairment of cognitive and physical function of delirium on top of dementia. With the widely reported poor prognostic outcome of DSD, more research is urgently needed to identify the factors that are associated with the ability of the patient with DSD to engage in cognitive activities. Therefore, it is the aim of this study to assess the association of delirium and physical function with the ability of patients with DSD to engage in cognitively stimulating recreational activities, such as crosswords, activities, and game play.

Chapter 3

Methods

This study was a secondary data analysis from an original parent study by Dr. Ann Kolanowski and colleagues to test the efficacy of Recreational Stimulation for Elders as a Vehicle to Resolve Delirium Superimposed on Dementia (RESERVE-DSD) in older adults in a post-acute care setting.

Design

Parent Study

The original research team conducted a randomized controlled trial (RCT), funded by the National Institutes of Nursing Research. A RCT, according to Grove, Burns, and Gray (2012), is a classic means of examining the effects of interventions through comparison of a treatment group with a no-treatment group. This design is noted to be the strongest methodology for testing the effectiveness of a treatment because elements of the design, such as random assignment, limit potential for bias (Grove et al., 2012).

With approval from The Pennsylvania State University Institutional Review Board, the study was conducted in eight Northeast, Central, and South-central Pennsylvania nursing homes that provide post-acute/skilled nursing care. A total of 284 participants with DSD were enrolled in the parent study. The inclusion criteria were English speaking, 65 years of age or older, community-residing prior to most recent hospitalization, having mild to moderate dementia and

delirium at screening, and having a responsible party (spouse or adult child) who can provide medical history, education, occupation, and leisure data. After receiving informed consent, participants were randomly assigned to either the control group receiving usual care or the intervention group to test the efficacy of RESERVE-DSD (Kolanowski et al., 2011).

Current Study

The present secondary data analysis aimed to examine the association of delirium and physical function to the engagement of cognitively stimulating activities. As defined by Grove, Burns, and Gray (2012), a secondary data analysis involves exploring new relationships with data previously gathered in another study. Data is reexamined with the use of different subsets of the data or variables and different statistical analyses from those previously used (Grove et al., 2012). Given the study purpose, this study only included the participants of the intervention group (N=141 participants) in the analysis.

Outcome Measures

Baseline Characteristics

Baseline data, including dementia stage, delirium assessment, and physical function were established for every participant, and activity interests for the 141 intervention participants were also recorded (Kolanowski et al., 2011).

Delirium. The Confusion Assessment Method (CAM) (Appendix B) is a diagnostic algorithm to identify the symptoms of confusion associated with delirium. It is based on four

cardinal features: 1) acute onset and fluctuating course, 2) inattention, 3) disorganized thinking, and 4) altered level of consciousness. A diagnosis of delirium according to the CAM requires the presence of both criteria 1 and 2, in addition to either criterion 3 or 4 (Inouye et al., 1990). In the study, the CAM was scored from 0-4, where 0 means no criteria and 4 means all criteria present. The CAM was validated against geriatric psychiatrists' ratings using DSM-III-R criteria and has been shown to have a high sensitivity between 94% and 100%, a high specificity between 90% and 95%, and a high inter-rater reliability (Inouye et al., 1990).

Physical Function. Deficits in physical function, as assessed via activities of daily living (ADLs), parallel the changes in cognition that accompany delirium (Fick et al., 2002). The Barthel Index (BI) (Appendix C) is a 10-item ordinal scale that highlights deficits in physical function that accompany delirium. Specifically, this tool measures functional independence in the areas of feeding, bathing, grooming, dressing, controlling bowel and bladder, toilet use, transfers from bed to chair and back, mobility on level surfaces, and ascending and descending stairs. Barthel scoring is done through assignment of values (in increments of five) to the different ADLs, with higher scores indicating greater ADL independence and the corresponding improvement in cognition. Scores 0-20 indicate total dependency, 21-60 indicate severe dependency, 61-90 indicate moderate dependency, and 91-99 indicates slight dependency. A score of 100 would be a fully independent individual (Barthel & Mahoney, 1965). Historically, the BI has been shown to have fair to moderate reliability. Shah, Vanclay, and Cooper (1989) reported alpha internal consistency coefficients of 0.87 to 0.92 for this scoring system.

Engagement of Activity. Participants' engagement in cognitively stimulating activities were assessed in three approaches using the Engagement Rating Form (ERF) (Appendix D). The ERF is an instrument designed specifically for the parent study, and therefore, reliability and

validity measures do not exist for this form. The ERF recorded scores for level of participation, time on task, and attempts at activities by domain. First, to measure the extent of participation in recreational activities, scores range from 0 to 3 with descriptors for each numerical rating: dozing, null, passive, active, in which higher scores indicate greater participation. Secondly, during each intervention session, the RA used a stopwatch to time the minutes and seconds that the participant engaged in activities, which was recorded as time on task. Thirdly, activities attempted per cognitive domain indicate which categories (easy, moderate, hard) were attempted by the participant. Using the information from this form, total dosage of engagement received was calculated by weighing each daily time on task score by level of participation score and then summing across intervention days (Kolanowski et al., 2011).

Procedures of Cognitively Stimulating Activities

Participants received the intervention for up to 30 minutes each day for 30 consecutive days between the hours of 1pm and 5pm. Daily assessments were completed on all participants between 9am and noon. Because delirium status (and consequently physical function) fluctuates, daily measures were taken by RAs to capture the variability typical of DSD (Kolanowski et al., 2011).

Intervention

The intervention included 99 different types of recreational nonpharmacological activities, listed in Appendix E. Based on each participants' baseline data, three recreational activities tailored to the subject's functional abilities and designed around themes of their

interests were selected by level of difficulty in each cognitive domain. For example, a subject who has arthritic problems with their hands, a mild stage of dementia, and a history of interest in gardening might be prescribed: identify the sound of a lawn mower (attention); discuss whether the current calendar month is good for planting (orientation); memory tray with three or more garden tools (memory); describe steps to planting a garden (abstract thinking); and having the subject plant flower seeds using adapted hand tools (executive functioning). Using the domain of attention as an example, increasing the level of difficulty might proceed in this fashion: lawn mower sound identification (easy); circle the garden tools (moderate); item search of vegetables embedded in a "busy" picture (difficult). Variety was provided from day to day to encourage cognitive processing and to prevent a practice effect (Kolanowski et al., 2011).

Data Analysis

Descriptive statistics were generated for all variables involved in the study, including the cost of the activities to allow for a fuller picture of expense implications. Descriptive statistics included frequency distributions and measures of central tendency. The statistics were used to describe the characteristics of the sample and study variables.

Through use of Microsoft Excel, averages were calculated for participant engagement, as well as attempted activities per domain and then by level of difficulty.

To answer the proposed research questions, Pearson's product moment correlation coefficient was used in Statistical Analysis System, 9.4 (SAS) to show if and how strongly pairs of variables were related. Using the activities' total dosage in each cognitive domain and across all domains, we analyzed their relationship with delirium as measured by the CAM and physical

function as measured by the BI through bivariate correlational analysis. Such analysis measures the association between two variables. The Pearson's product moment correlation coefficient, r, can range in value from -1.00 to +1.00. A negative or inverse correlation indicates values less than 0 (if X increases, Y decreases and if X decreases, Y increases). A value of 0 indicates no relationship between variables. A value greater than 0 indicates a positive relationship (if X increases, Y increases, and vice versa). The stronger the value is to either -1 or +1 determines the strength of the association between variables (Grove et al., 2012).

Summary

In conclusion, through use of descriptive statistics and bivariate correlations, this secondary data analysis determined the association of delirium, as measured by the CAM, and physical function, as measured by the BI, to engagement in activities completed in each cognitive domain, recorded on the ERF.

Chapter 4

Results

In this chapter, presented are the results of the analysis of: 1) In older adult patients with DSD, what is the association between delirium and engagement in cognitively stimulating activities overall and in each cognitive domain? 2) In older adult patients with DSD, what is the association between physical function and engagement in cognitively stimulating activities overall and in each cognitive domain?

Sample

From the sample of 141 participants, the average participant was likely to be a white male and 85 years of age. Detailed demographic information can be found in Table 1.

Table 1
Demographic Information (N=141)

Variable	Frequency	Percent (%)
Gender		
Female	61	43.26
Male	80	56.74
Race		
Caucasian	137	97.16
African American	4	2.84
Age		
60-70	6	4.25
71-80	27	21.28
81-90	72	51.06
91-100	32	22.70
> 100	1	0.71

Cognitive description of this sample (Table 2) included a mean Mini Mental Status Exam (MMSE) of 14, Clinical Dementia Rating (CDR) of 1.2, and Modified Blessed Dementia Rating

Scale (MBDRS) of 6. The mean Confusion Assessment Method (CAM) score was 0.9, and the average Barthel Index (BI) score was 41. These numbers indicate that this sample had DSD with severe dependency in activities of daily living (ADLs).

Table 2
Cognitive Description of Sample

Variable	N	Mean	Standard Deviation	Minimum	Maximum
MMSE	140	14.36	5.96	0	27
CDR	141	1.21	0.58	0.5	2
MBDRS	141	6	2.42	3	13
CAM	2727	0.93	1.14	0	4
BI	2704	40.76	26.14	0	100

Note: MMSE, CDR, MBDRS collected upon admission. CAM and BI collected daily.

MMSE – Mini Mental Status Exam. CDR – Clinical Dementia Rating. MBDRS – Modified Blessed Dementia Rating Scale. CAM – Confusion Assessment Method. BI – Barthel Index.

Intervention and Cognitive Domains Descriptives

The intervention included 99 different types of recreational nonpharmacological activities that were tailored to each participant's interests and functional abilities. Appendix E provides a list of all 99 activities. A participant had the potential to attempt up to 15 activities during every 30-minute session, as the goal was to complete 3 activities (easy, moderate, difficult) in each of the 5 cognitive domains. In the total sample, there were 2,504 activity sessions. Overall, each participant was engaged in activities 56% of the time and completed 8.71 activities on average. In 33% of the 2,504 sessions, all 15 prescribed activities were attempted across the 5 domains at all levels of difficulty. Table 3 presents the percentage of days when all 3 activities were attempted in each individual cognitive domain.

Table 3
Average Attempted Activities Per Domain

Cognitive Domain	Percentage (%)
Attention	60.54
Orientation	55.63
Memory	52.11
Abstract Thinking	50.71
Executive Functioning	40.17
Across all domains	33.43

Table 4 shows the breakdown of the number of activities attempted in each level of difficulty per cognitive domain. When looking at each domain, the more difficult the activity, the fewer activities that were attempted. It can also be noted that the number of activities attempted in each domain gets incrementally smaller respectively.

Table 4
Average Attempted Activities Per Domain by Level of Difficulty

Cognitive Domain	Percentage (%)
Attention	
Easy	70.53
Moderate	65.50
Difficult	61.10
Orientation	
Easy	68.25
Moderate	63.78
Difficult	55.99
Memory	
Easy	65.50
Moderate	59.70
Difficult	52.76
Abstract Thinking	
Easy	59.74
Moderate	56.43
Difficult	51.00
Executive Functioning	
Easy	53.19
Moderate	46.53
Difficult	40.93

In 77% (N= 1,937) of the 2,504 sessions, each participant attempted at least one activity. The activity with greatest frequency was a *non-equipment activity*, which was used 37% of the time. A *non-equipment activity* can be described as a verbal response to questioning. For example, the Research Assistant (RA) could ask the participant to name three kinds of fruit or what month holidays are celebrated in. *Finish the phrase* (6%), an easy intervention for memory that uses well known expressions, *Brain Fitness* (5%), a moderate/difficult abstract thinking intervention, and *Fanfare matching game* (4%), an easy intervention in executive functioning that required sorting of cards by shape, color, and/number, were also commonly used among participants. Table 5 shows the cost per most frequently used activity.

Table 5
Most Frequently Used Activities

Activity Description	Percentage of use (%)	Cost
Non-equipment activity	36.6	$0.00
Finish the Phrase	5.7	$25.93
Brain Fitness	4.5	$42.68
Fanfare matching game	4.1	$14.82

Examination of the bivariate relationships between the nine variables can be seen in Table 6. The nine variables include participant participation, the cognitive domains of attention, orientation, memory, abstract thinking, and executive functioning, total of activities attempted, BI, and CAM. This resulted in 36 unique correlations. Of these 36 correlations, 21 were significant ($p < .0001$). Fifteen of the thirty-six correlations were not significant. Neither the correlations involving the BI nor the total activities attempted were significantly associated with any other variables.

Table 6

Bivariate Correlations of Participation, Cognitive Domains, BI, and CAM

	Participation	Attention	Orientation	Memory	Abstract Thinking	Executive Functioning	Activities Total	Barthel Index	CAM
Participation	1.00000								
p-value									
N	139								
Attention	0.39459	1.00000							
p-value	<.0001								
N	139	139							
Orientation	0.47054	0.96157	1.00000						
p-value	<.0001	<.0001							
N	139	139	139						
Memory	0.51578	0.94838	0.96639	1.00000					
p-value	<.0001	<.0001	<.0001						
N	139	139	139	139					
Abstract Thinking	0.55325	0.89843	0.92309	0.94544	1.00000				
p-value	<.0001	<.0001	<.0001	<.0001					
N	139	139	139	139	139				
Executive Functioning	0.54917	0.80813	0.82560	0.86784	0.93686	1.00000			
p-value	<.0001	<.0001	<.0001	<.0001	<.0001				
N	139	139	139	139	139	139			
Activities Total	0.24064	0.26684	0.27874	0.27404	0.27041	0.22245	1.00000		
p-value	0.0056	0.0021	0.0013	0.0015	0.0018	0.0107			
N	131	131	131	131	131	131	131		
Barthel Index	0.02815	-0.01930	0.00069	-0.00434	0.01469	0.01024	0.04058	1.00000	
p-value	0.7422	0.8216	0.9936	0.9595	0.8638	0.9048	0.6454		
N	139	139	139	139	139	139	131	139	
CAM	-0.56277	-0.40563	-0.43232	-0.43902	-0.50474	-0.54010	-0.21780	-0.07099	1.00000
p-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0125	0.4063	
N	139	139	139	139	139	139	131	139	139

Research Question 1

To answer the first question concerning the association between the presence of delirium (CAM scores) and total number of attempted activities attempted, results showed a small negative ($r= -0.22$) but statistically significant ($p<0.0001$) relationship. This means that when CAM scores increased (signifying more indicators of delirium), total number of activities attempted decreased. When looking at each domain individually, all exhibited a negative relationship with CAM scores (Table 7), and this relationship became incrementally stronger with each domain. Attempting activities under the executive functioning domain showed the strongest negative relationship with CAM scores.

Table 7
Correlation Between CAM Scores and Activities in Each Domain

Cognitive Domain	N	r	p
Attention	139	-0.40563	<0.0001
Orientation	139	-0.43232	<0.0001
Memory	139	-0.43902	<0.0001
Abstract Thinking	139	-0.50474	<0.0001
Executive Functioning	139	-0.54010	<0.0001
Activities Total	131	-0.21780	0.0125

Research Question 2

To answer the second question concerning the association between physical function (Barthel scores) and total number of activities attempted, there was a very small nonsignificant relationship ($r=0.041$) (Table 8). Therefore, in this sample, it can be stated that physical function and number of activities are not significantly related.

Table 8
Correlation Between BI Scores and Activities in Each Domain

Cognitive Domain	N	r	p
Attention	139	-0.01930	0.8216
Orientation	139	0.00069	0.9936
Memory	139	-0.00434	0.9595
Abstract Thinking	139	0.01469	0.8638
Executive Functioning	139	0.01024	0.9048
Activities Total	131	0.04058	0.6454

In conclusion, there was a small yet statistically significant negative relationship between delirium and the number of activities attempted; however, the association between physical function and the number of activities attempted was not significant or correlated.

Chapter 5

Discussion

This study investigated the relationship of both delirium and physical function with engagement in cognitively stimulating recreational activities completed in multiple cognitive domains (attention, orientation, memory, abstract thinking, and executive functioning) in the context of delirium superimposed on dementia (DSD) in older adults in a post-acute care setting. This study found a small negative, yet statistically significant relationship between delirium and the number of activities attempted; however, physical function and number of activities attempted was not significantly related in this study.

It is noteworthy to address that, out of all domains, the smallest number of activities attempted was in the domain of executive functioning. Furthermore, while the negative relationship between delirium and number of activities attempted was expected, the lack of significance in the relationship between functional status and activities was not. In addition, it was interesting that while 99 activities were available to all participants, only 4 of the activities were most frequently selected.

The Relationship of Delirium to Executive Functioning Domain

The first interesting finding in this study was that out of the five cognitive domains, attempting activities under the executive functioning domain showed the strongest negative relationship with CAM scores. This means that when CAM scores increased (signifying more indicators of delirium), the least amount of attempts were made with the executive functioning activities. According to Alvarez and Emory (2006), the frontal lobe of the brain controls

executive functioning, and these functions generally are referred to as "supervisory" cognitive processes because they involve higher-level organization and execution of complex thoughts. The intricacy involved in this domain offers an explanation of the difficulty participants had in attempting executive functioning activities in comparison to the other domains.

The Relationship of Physical Function to Cognitive Activities

Secondly, physical function and number of activities attempted was not significantly related in a DSD sample. The average participant had a Barthel Index (BI) score of 41, which can be interpreted as severe dependency in activities of daily living (ADLs). Logically, one would expect that number of activities attempted would be limited by declining physical function. However, there was no association between these two variables. Still, loss of physical function is a serious complication of delirium (Bee Gek Tay, Chew Chan, & Sian Chong, 2013), as was evident in this study, yet the association of physical function with delirium is complex and little understood. According to a recent Cochrane Review of 15 dementia randomized controlled trials, there was no indication that cognitive stimulation was associated with improved ADLs, one commonly measured proxy for physical function in older adults (Woods, Aguirre, Spector, & Orrell, 2012). Similarly in this study, although physical function was associated with delirium severity, it was not found to correlate with completion of cognitively stimulating activities.

One possible explanation for this lack of association between physical function and cognitive stimulation may be that the activities in this study did not require physical engagement beyond that of the tactile sense of a puzzle or board game. Restating the example from Chapter

3, a participant who has arthritic problems with their hands, a mild stage of dementia, and a history of interest in gardening might have been prescribed the sequence of following activities: identify the sound of a lawn mower (attention); discuss whether the current calendar month is good for planting (orientation); memory tray with three or more garden tools (memory); describe steps to planting a garden (abstract thinking); and having the participant plant flower seeds using adapted hand tools (executive functioning) (Kolanowski et al., 2011). When examining the example, you can see that only planting the flower seeds would be considered an activity needing some level of physical function. However, in providing adapted hand tools, any physical limitations are potentially mitigated resulting in a completed activity despite serious debility. Supporting this explanation, the activity with greatest frequency in this study was a *non-equipment activity*, described as a verbal response to questioning. Examples of this verbal exercise are: name 3 fruits, name the month that Thanksgiving or Valentine's Day is celebrated, or explain how to bake a cake. While these activities absolutely facilitate cognitive processing, they do not necessarily encourage nor require physical function.

The Frequency of Activity Use

Another finding was that, out of the 99 activities for intervention, 4 were selected more often than others. These activities included a *non-equipment activity, Finish the Phrase, Brain Fitness,* and *Fanfare matching game*. As stated previously, a *non-equipment activity* can be described as a verbal answer to inquiring of common knowledge. *Finish the phrase* involved the research assistant beginning a well-known phrase and the participant finishing the expression. *Brain Fitness* involved questioning such as "If you were a… what would you be, and why?"

Fanfare matching game was the sorting of cards by shape, color, and/number. The use of the selected activities may be a function of the interventionist, the individual being tested, or the clinical environment.

Interventionist bias could have influenced activity selection. While recreational activities were tailored to the participant's functional abilities and designed around themes of their interests, it was the interventionist who ultimately selected the participant's activity prescription. Similar questions were raised about potential bias in a study in which the non-pharmacological interventions in dementia were chosen and delivered by the same research assistant who completed the intervention measurement tool. Authors explained that there was no a priori suggestion that any intervention would prove better than another (Cohen-Mansfield et al., 2015), and this was true for this research's parent study, as well. Still, with such interventions, it is impossible to totally blind staff to treatment, and success with one activity could form an unconscious selection bias for future sessions. A second possible source of bias may have been the interventionist's own interest in a particular activity. For example, an interventionist who liked to listen to Louie Armstrong may have been more likely, once again unconsciously, to select *The Best of Louie Armstrong CD* for intervention. One way to possibly control for this in future studies would be to use a random assignment mechanism to develop the activity prescription.

Frequency of activity use could also be a function of the individual being tested. Since the games and exercises were specifically selected for each individual participant, life experience and previous activity familiarity could have influenced use. Similar to the potential interventionist bias mentioned previously, a participant is much more likely to engage in an activity he/she enjoys from, say, childhood versus one he/she has never used. Still, individual

interests are important in the design of cognitive activities because people are naturally motivated to participate in activities that are interesting to them and include elements that are both familiar and enjoyable. To support this, Cohen-Mansfield et al. (2015) specifically spoke to the importance in individualizing non-pharmacologic interventions in that personalization is the best approach to lowering agitation so common in dementia patients.

Finally, it is possible that the clinical environment shaped the preference for particular activities. Level of environmental comfort with surroundings conducive to activity engagement may have impacted participation. External distracting stimuli can influence usage of one activity over another, particularly for the DSD population in which the domain of attention is the primary neuropsychological deficit (Wacker, Nunes, Cabrita, & Forlenza, 2005). For example, any kind of external noise in the setting in which the intervention was taking place would make all sound identification activities difficult to use. Likewise, lighting fixtures would be important for exercises that require visual searching for objects embedded in a busy picture. Therefore, the designated space could have influenced engaging with or completing the intervention. Existing literature does not address this particular element, but it is evident that environmental factors can play a significant role in the outcome of treatment.

Clinical Implications

The one-year total health care costs associated with delirium are estimated at up to 152 billion dollars, a health care cost rivaling that of diabetes or falls (Leslie & Inouye, 2011). In a retrospective study of 76,688 community-living older adults, those with DSD had the highest total healthcare costs, the largest number of acute care stays, and the highest number of skilled

short stay nursing home admissions over a three year period in comparison to older adults with dementia or delirium alone (Fick, Kolanowski, Waller, & Inouye, 2005).

Table 8 depicts the activities most used in this study and the approximate cost of implementation. As stated earlier, a *non-equipment activity* was utilized most often. This activity has no monetary cost. In addition, this particular activity, which involves quizzing a participant's common knowledge, can be used across all five cognitive domains affected by delirium. Even the highest priced activity that was regularly selected (*Brain Fitness; $42.68)*) is still more cost effective than many drugs used in this population, particularly notable when considering long-term use. These activities are simple, non-technical and easily replicated interventions, making them ideal for implementation across settings of care and geographic areas.

Safety is also an important consideration when performing treatment on a vulnerable DSD population. To manage the neuropsychiatric symptoms of delirium and/or dementia, physicians often prescribe benzodiazepines and antipsychotics to control the behavior without addressing the underlying etiology of the delirium. These medications do alleviate the difficult behaviors that accompany the confused states (Alanen et al., 2006); however, the use of almost any medication to treat behavioral changes with delirium can further cloud the patient's mental status and obscure efforts to monitor the course of the mental status change (Fong et al., 2009). Therefore, to minimize this potential risk of increased mental status change, nonpharmacological strategies could potentially serve as first line of treatment, as they have been demonstrated to be harmless, feasible, and effective (Kolanowski et al., 2011).

However, there is a limiting factor with implementation of these non-pharmacological activities. An intervention like Recreational Stimulation for Elders as a Vehicle to resolve Delirium Superimposed on Dementia (RESERVE-DSD) requires a certain degree of professional

dedication and compassion for implementation. Pharmacological treatment takes less staff time and effort, but non-pharmacological intervention is safer and may be just as effective for the patient. Realistically, non-pharmacological interventions may need regulatory support before becoming feasible. Policy changes are needed to support adequate staffing patterns and first-line use of non-pharmacological interventions in DSD. In the meantime, healthcare facilities may be able to engage volunteers or family members to conduct recreational activities.

Research Implications

Future research on the influence of cognitively stimulating recreational activities on DSD patients should begin with a larger-scale study to extend and explicate the results of the parent study from which this data was taken. This study ended after a 30-day intervention, so future research should explore the longer-term impact of the activities on DSD patients and their life quality. A more holistic view of the intervention is likely to be meaningful, both to researchers interpreting study findings as well as to clinicians and those receiving treatment. Examining the role of such activities in delirium and the outcome of delirium-focused interventions is a greatly needed addition to the scientific literature.

Secondly, this study was conducted in eight nursing homes that provide post-acute/skilled nursing care, including individuals who were well into their course of DSD. It may be worthwhile for researchers to delve into the effect of implementing this study's non-pharmacological intervention of cognitively stimulating recreational activities as early as acute care, as DSD frequently occurs in hospitalized elderly individuals (Fick & Foreman, 2000). If

recognized and treated promptly before discharge into post-acute care, the negative personal, social, and financial consequences of DSD may be lessened.

Finally, the deficits in physical function that parallel the changes in cognition that accompany delirium are in need of attention in the nursing science. It is possible that this study's intervention lacked facilitation of engagement in ADLs, an association between activity completion and functional status was not found. Nevertheless, research states that in persons with dementia, every additional ADL impairment results in added healthcare costs of $1,541 per year and a heightened probability of nursing home placement (Hill, Fillit, Thomas, & Chang, 2006).

Limitations

First and foremost, this study was a secondary data analysis, and thus the research questions were developed after data was collected. Additionally, the Engagement Rating Form (ERF) was an investigator-generated form developed specifically for the parent study, and therefore it does not have existing psychometrics or reliability and validity measures. Furthermore, this study only tested cognitively stimulating activities, so the findings may not be comprehensive to other types of non-pharmacological interventions. Lastly, the sample lacked in diversity, did not include individuals with advanced dementia, and only came from the state of Pennsylvania, limiting this study's generalizability.

Conclusion

This study revealed that level of delirium is associated with engagement of cognitively stimulating activities. However, the level of physical function was not found to be associated with activity engagement. These findings will help guide intervention design for people with DSD. Specifically, interventions for DSD may need to be tailored based more so on individuals' severity of delirium, as individuals' physical function does not impede their capacity to carry out cognitively stimulating activities. In the latest day, the prevalence of dementia is increasingly yearly in the United States (Alzheimer's Association, 2015), therefore so is the risk of developing delirium within the older adult population. It is consequently imperative to better understand the relationships between delirium, functional status, and engagement in the novel intervention of cognitively stimulating recreational activities before we can recommend widespread use and advance the science.

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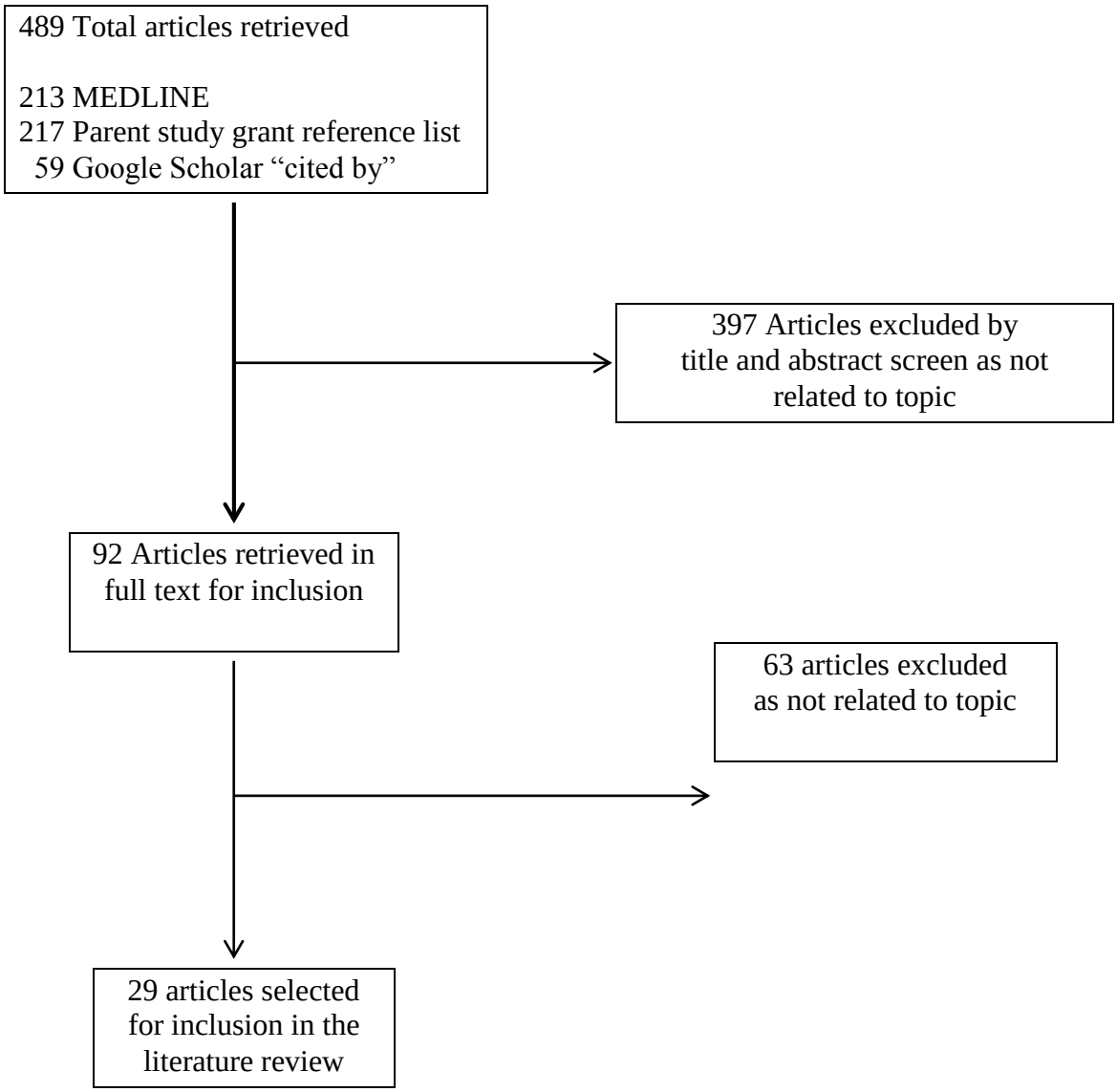
Appendix A

Original Literature Review Tree*



*Subsequent hand searches conducted after reference list and expert review

Appendix B

Confusion Assessment Method

Participant Code: **Facility Code:** **Date:**

I. Acute Onset and Fluctuating Course		
Is there evidence of an acute change in mental status from the participant's baseline?	Yes	No
Did the (abnormal) behavior fluctuate during the day, that is, tend to come and go or increase and decrease in severity?	Yes	No
II. Inattention		
Did the participant have difficulty focusing attention, for example, being easily distractible or having difficulty keeping track of what was being said?	Yes	No
III. Disorganized Thinking		
Was the participant's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable, switching from participant to participant?	Yes	No
IV. Altered Level of Consciousness		
Overall, how would you rate the participant's level of consciousness? Alert Vigilant (hyperalert) Lethargic (drowsy, easily aroused) Stupor (difficult to arouse) Coma (unarousable)		
Did you rate level of consciousness as anything other than Alert (normal)?	Yes	No

Please indicate delirium subtype:

Hyperactive
Hypoactive
Mixed
None

Appendix C

Barthel Index

Participant Code: **Facility Code:** **Date:**

Activity	Score
FEEDING 0 = unable 5 = needs help cutting, spreading butter, etc., or requires modified diet 10 = independent	
BATHING 0 = dependent 5 = independent (or in shower)	
GROOMING 0 = needs help with personal care 5 = independent face/hair/teeth/shaving (implements provided)	
DRESSING 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.)	
BOWELS 0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent	
BLADDER 0 = incontinent or catheterized and unable to manage alone 5 = occasional accident 10 = continent	
TOILET USE 0 = dependent 5 = needs some help, but can do something alone 10 = independent (on and off, dressing, wiping)	
TRANSFERS (BED TO CHAIR AND BACK) 0 = unable, no sitting balance 5 = major help (one or two people, physical), can sit 10 = minor help (verbal or physical) 15 = independent	
MOBILITY (ON LEVEL SURFACES) 0 = immobile or < 50 yards 5 = wheelchair independent, including corners > 50 yards 10 = walks with help of one person (verbal or physical) > 50 yards 15 = independent (but may use any aid; for example, stick) > 50 yards	
STAIRS 0 = unable 5 = needs help (verbal, physical, carrying aid) 10 = independent	

Appendix D

Engagement Rating Form

Participant Code: **Facility Code:** **Date:**

Assent
Unavailable

1. **Level of Participation**
   Rate the participant's level of participation for 50% or more of the time engaged.
   Select one of the following:
   0 = Dozing: Eyes closed
   1 = Null: Physically inactive, eyes opened but not focused on a particular event or person, and no purposeful activity apparent
   2 = Passive: Paying attention to the activity, others participating in the activity, or the interventionist, or commenting on the activity while not directly engaging in the activity
   3 = Active: Physically or verbally engaging in the steps of an activity

2. **Time on Task**
   Begin timing with stopwatch when you obtain assent. Continue timing for 30 minutes or until the participant disengages from the activity four times.

   Total number of minutes and seconds participant was engaged in the activity:

   Disengagement during activity (check if occurs): Once
   Twice
   Three times
   Four times

   Definitions

   Engagement is demonstrated by the participant making eye contact with the interventionist or activity, vocalizing pleasure with the activity, and/or physically (verbally) participating in the activity for 15 seconds.

   Disengagement is demonstrated by the participant's dozing, negative remarks about the activity, turning away from the interventionist or activity, asking to leave, leaving or attempting to leave the area.

3. **Activities by Domain**
   Indicate which categories (Easy, Moderate, Hard) were attempted in each domain.

	Easy	**Moderate**	**Hard**
Attention			
Orientation			
Memory			
Abstract Thinking			
Executive Functioning			

Appendix E

List of Activities

CODE #	ACTIVITY DESCRIPTION	COST per item (includes shipping)
1	Memorex CD Player	$27.88
2	Tape Recorder	$450.00
3	Sound Machine	$92.68
4	The Best of Louie Armstrong CD	$12.61
5	Haller Plays Cleveland Style Polkas CD	$16.71
6	Mitch Miller Sing Along CD	$13.72
7	Reminiscing Series Volume I CD	$7.50
8	Reminiscing Series Volume II CD	$19.72
9	The Best of Irish Music CD	$4.65
10	Celtic Favorites CD	$6.72
11	Sinatra Reprise CD	$5.23
12	Greatest Hits Broadway CD	$11.89
13	Find It At the Zoo	$20.68
14	3-D Wooden Dinosaur Puzzle	$7.23
15	Pattern Bead Stacker	$24.63
16	3-D Feel and Find	$22.68
17	Foam Shapes (Colors, too)	$15.16
18	Pipe Construction Set	$21.70
19	Tinkertoys	$32.37
20	Wood Pattern Blocks	$26.49
21	Make ‘N’ Break block set	$25.70
22	Wooden Shape-Sorting Cube	$15.63
23	Whac-a-Mole	$67.72
24	Wheel of Fortune	$18.21
25	Dominoes	$5.22
26	Launch Across	$32.72
27	Complete the Phrase	$25.93
28	Poker-Keeno	$23.73
29	“Can You See What I See?”	$14.82
30	Fanfare	$31.34
31	SET: Visual Perception game	$12.21
32	Deck of Playing Cards	$1.59
33	Shake Loose a Memory	$24.63

34	Bingo	$69.29
35	Family Dinner Box of Questions	$22.15
36	Baby's Face puzzle	$9.75
37	Tractor puzzle	$9.75
38	Black Puppy puzzle	$9.75
39	Tools puzzle	$9.75
40	Window Scene puzzle	$0.00
41	Duck puzzle	$0.00
42	Colorful Geometric puzzle	$13.68
43	Kumon: Pasting Jigsaw puzzles	$9.68
44	Magnetic Animal puzzle (large pieces)	$9.94
45	Memory Tray of Sewing items	$15.06
46	Memory Tray of Tool items	$15.06
47	Memory Tray of Grooming items	$15.06
48	Memory Tray of Travel items	$15.06
49	Memory Tray of "Beauty" items	$15.06
50	Yellow Box of Tools, Electrical, Repair items	$0.00
51	Alphabet Dot-to-Dot	$7.68
52	Number Dot-to-Dot	$7.68
53	Kumon: Amazing Mazes	$9.68
54	Brain Quest	$11.50
55	"More This and That Trivia for Seniors"	$15.18
56	"Brain Fitness"	$42.68
57	"Trivia Pursuit for Kids Crosswords"	$8.68
58	"Great Crosswords for Kids"	$8.68
59	"Crossword Puzzles for Fun and Pleasure"	$5.68
60	"Find and Circle" Jumbo Word Search	$5.68
61	*Life:* "Picture Puzzle"	$11.93
62	FlagHouse catalogs	$0.00
63	"Whole Lotta Hangman"	$15.68
64	Binder of Word Games, MathProblems, etc.	$0.31
65	"Shooting Stars"	$6.72
66	*Life Legends: The Century's Unforgettable Faces*	$32.68
67	*Life Century of Change: America*	$62.73
68	Eldergames Famous Faces	$0.00
69	"Cars of the 1950's"	$14.68
70	"Horses and Ponies"	$21.72
71	*The Raven and Other Poems*	$6.48
72	*The Devil's Dictionary and Other Works*	$6.68
73	Magnetic Dry-Erase Board	$7.48
74	Costume Jewelry	$0.00
75	Boccia Ball	$61.07
76	Calendars	$17.38
77	Appleletters	$19.56
78	Activity Apron	$42.95

79	Wooden Picture Dominoes	$0.00
80	Tambourine	$14.43
81	Colored Paper	$6.72
82	Sewing Cards (Lacing with yarn)	$7.78
83	Bags of Money	$1.85
84	Hear and Go Seek: Everyday Sounds CD	$19.00
85	Grocery and Household items	$0.00
86	Hymns and Praise CD	$5.00
87	Non-equipment activity	$0.00
88	Busy pictures	$0.00
89	The Best of Etta James CD	$5.00
90	Incredible Gospel CD	$7.00
91	Map work (Atlas)	$15.96
92	“Clue Trivia” book	$11.61
93	“Finishing Line” book	$11.06
94	“Yesterdays” book	$0.00
95	Bananagrams	$14.95
96	“Fish of PA” book	$11.16
97	U.S.A. Flashcards	$0.00
98	“Clearfield County” book	$21.99
99	“Senior Smart Puzzles” book	$10.95
	*Items #61 and #88 are used interchangeably *Items #68 and #88 are used interchangeably	

Appendix F

Activity Examples by Cognitive Domain

Interventions for ATTENTION

EASY

1. Recite the alphabet or count to 10. Ask the participant to recite the alphabet or count from one to ten. Or have the participant use magnetic letters or numbers to put letters/numbers in the correct order.
2. Ask participant to identify how many times you clap your hands; repeat, varying the number of times. Do this without the participant being able to see your hands (stand behind the participant).
3. Sound Identification: out of view…clap hands, tap pencil, tear paper, stomp feet, bounce ball, and snap fingers (Brain Fitness, p.201). Use tape recordings of sounds that might be familiar: hair dryer, mixer, washing machine, sizzling bacon on stove top, saw, hammer, car motor, barking dog, meowing cat, bird singing, rain, wind, phone ringing, train, dripping faucet, flushing toilet, door bell, door knock, typewriter, clock ticking (other sounds on p. 204, Brain Fitness) Without the participant being able to see how you make these sounds, ask the participant to identify what the sound is.
4. What number comes between 1 and 3? 26 and 28? 2 and 4? Ex: Ask the participant to tell you what number comes between number 1 and number 3, continue with other sets of numbers.

MODERATE

1. Dot to Dot: connect numbers or letters in sequence (Brain Fitness, p.92 &94, 96). Give the participant a pencil. Have them start at number 1 and draw a line connecting number 1 to number 2 then draw a line from number 2 to number 3 and so forth. Using letters, proceed from the letter A drawing a line to letter B and so forth.
2. Identify objects: in a bag, provide objects for participant to feel, describe and identify. Use objects familiar to the participant: sandpaper, tools (screw driver, nail,) baking utensils, knife, fork, spoon. Ex: Using a large bag, place familiar items in it, but do not let the participant look into the bag. Let the participant place their hand in the bag and feel the item. Ask the participant to describe what they feel (the item is soft, hard, round etc.). Ask the participant to identify the object. Repeat with other items.
3. Bingo/pokeno: Play a round of bingo using a bingo card and markers until the participant completes a row on the bingo card.

DIFFICULT

1. Can You See What I See? Item search: search for familiar items in a picture. Select pictures that reflect participants past roles if able (mother, father, occupation, leisure interests). Show the participant a picture. Ask the participant to find an item in that picture. Ex. “Can you see the spoon?” Repeat with other items in the picture.

2. Concentration card game: use 3 or 4 cards from a deck of cards, have participant pick from the pile and see if they can add in sequence to one of the numbers laid out, continue to build sequence. Ex: Lay out 4 cards [a 2, a 6, a 10 and a Queen] with the rest of the cards, have the participant pick from the top of the deck. If it is a 7, the participant should place the 7 next to the 6. Continue picking cards and placing them in numerical order to the other cards already laid out.
3. Word search sheets: (use magnetic words or letters or word sheets) use words from the participants' occupation, leisure activities or role function (ex. father or mother). Ex: Ask the participant to find the word "hammer" within the word sheet.
4. Find the Differences: show two similar pictures and identify the difference. Ex: Ask the participant "What is different about this picture from the first picture?"
5. Identify all similar items within a picture. Ex. all flowers, all sport items, all cooking items. Ex. Ask the participant to point out all the flowers in the picture.
6. Bingo- four corners. Using the Bingo game, call out numbers [B9 ,N32] until all four corners of the bingo card are filled.

Interventions for ORIENTATION

EASY

1. "Draw" number 8 in the air, one arm then the other, may continue with other numbers or letters. Ex: ask the participant to watch your hands then draw a number or letter in the air using one hand then the other. Ask the participant to identify the number or letter.
2. Two boxes with dots- match dot location in one box with a dot in same location in a second box

MODERATE

1. Finger Math. Ask to show 4 fingers. Ask to show using both hands, ask to show using a different combination. Continue with the other numbers. Ex: ask the participant to show you the number 3 on one hand. Ask them to show you 3 on the other hand. Ask them to show you 3 on one hand and 2 on the other hand.
2. Maneuver toothpicks to form name or word selected by participant. Ex: place some toothpicks on the table before the participant. Ask the participant to pick a name or word that they will spell out using the toothpicks to form the letters.
3. Calendar work: have participant identify month, how many days, weeks, holidays etc. Ex: open a calendar to a month [July] in front of the participant. Ask them to identify what month it is, how many weeks there are in this month, how many days, are there any holidays? [4th of July], how many Thursdays in this month? What is the weather like this month? etc.
4. Where am I? describes general places (Big city, the beach) To make it more difficult use specific places (White house, Golden Gate Bridge). Ex: say to the participant, "I am standing in the sand looking at the ocean. I see sea gulls. Where am I?"

DIFFICULT

1. Map Work, use local or state map. Have participant identify where they live and other places of interest. Ex: show the participant a map of Pennsylvania. Ask them to find the

town they are living in. Ask if they were born in PA, what town and where is it? Have they visited any other cities? Do they know where the Capital is? What is the largest city? etc.

2. Discuss current events from Newspaper .Ex: read an article from a local newspaper. Ask the participant what they think of the story, do they agree or disagree with it? Is it a good thing or a bad thing? What do they think of the situation?
3. Use Geometric or picture puzzles. Ex: put geometric shapes in front of the participant. Ask them to create a picture or pattern [flower] or ask them to put a puzzle together. Say, "This is a puzzle of a dog, can we put it together?"
4. Use Tinker toys to build. Ex: give the participant the Tinker Toys. Start to connect some of the pieces and ask what they would like to make, a house, a bridge, a car, a table etc.. Ask "how shall we do this?" Let them build. Examples are on the box.
5. Use wood blocks to build objects or form shapes. Ex: Place the blocks in front of the participant .Ask them what they would like to build, a building, a table or chair, stairs, etc. or form shapes with the blocks, a flower or tree, a star, a face, etc.
6. Play Tiddly Winks. Ex; each player chooses a color. Place the pot in the middle of the players. Each player takes a turn trying to flip their Winks [colored disks] into the pot.
7. Build with pipes and connectors (in Red tool box). Ex: give the box to the participant, ask them to open it. Ask them to connect the pipes using the connectors like a piping system.
8. Use foam shapes to build forms. Ex: put the colorful foam shapes in front of the participant. Start with one shape and have the participant add to it to make a pattern or shape. See how the forms fit together to fill a space.

Interventions for MEMORY

EASY

1. Name two items that are familiar to participant, wait a minute and ask the participant to repeat them. Ex. Say, "I am going to ask you to remember 2 words, the words are "hammer" and "pencil." Wait 60 seconds and ask the participant if they can repeat the two words.
2. "Finish the Phrase" cards- use well known phrases. Ex: begin the phrase, "A stitch in time" … let the participant finish the phrase "saves nine."
3. Advertising Slogans- fill in the product (Brain Fitness, p.160-161). Use slogans that are consistent with gender identity/ past roles: Ex. "A little dab will do you": Brell cream (men); "Good to the last drop": Maxwell coffee (homemaker)

MODERATE

1. Show participant 3 items, place each in a bag and have client place hand in bag and identify the object by the feel of it. Ex: show the participant a comb, a pencil and a pair of glasses, then place the items in a large bag. Have the participant place their hand in the bag [without looking in] and ask them to identify the object by the feel of it.
2. Identify famous faces (movie stars, historical figures from pictures and books). Ex: Using one of the picture books, show the participant a photo of a famous person (Abraham Lincoln) and ask them to identify that person.
3. "Finish the Phrase" cards- use less well known phrases.

DIFFICULT

1. "Memory Tray"- show a tray of 5 items familiar to the participant for one minute. Ask participant to write down as many as possible. Ex: place a comb, a piece of jewelry, a mixing spoon, a clothespin, and a bottle of nail polish on the tray. Let the participant look at the items for one minute then take the tray out of view and ask the participant to write down the items on a paper.
2. "Shake loose a memory" Game (dice and cards with memories).
3. Play Tapes and CDs of old songs ask participant to identify the song and artist- name that tune.
4. Have participant complete a Nursery Rhyme. Ex: Start the rhyme "Mary had a little lamb"… ask the participant finish it." Its fleece was white as snow…….

Interventions for ABSTRACT THINKING

EASY

1. "Hand Pantomime"-ask participant to identify objects/actions you pantomime with your hand (spider, bird, writing, signaling STOP, waving, Victory sign etc.).
2. Ink Spots -ask participant " What does the design look like to you?" Discuss (Brain Fitness, p.42)
3. Low to high card game. Using a deck of cards, have the participant pick a card and place it on the table. Have the participant pick a second card, if this card numerically follows or precedes the original number, have the participant place the card in the proper position before or after the original card. Continue to play in this manner.

MODERATE

1. Play "Finish the Story". Using familiar events, ask the participant to finish your story. For example, "I was going to bake a cake and went to the cupboard and found there was no flour"- what happened next?
2. Dominos- regular or wood picture blocks. Divide the dominoes or wood picture blocks up evenly between the participant and yourself. Place one Domino or block on the table to start the game. Each player, using his own dominos, places a matching number or picture next to the same number or picture on the original domino or picture block. Take turns, using up all pieces.
3. Abstract Picture- have participant add lines to an initial figure to make a picture -in Brain Fitness Book, p. 36. Ex: two parallel lines can become a table or a square.
4. Place different items on a tray and ask the participant to "pair" those that are similar .Use kitchen items, tools, blocks (squares, triangles etc.). Ex: Have the participant pair a fork and a spoon or a hammer and a nail.
5. If you were a… What would you be? Why? (Brain Fitness, p.39)
6. Challenge List: Things that can Fly, Things that are invisible… (Brain Fitness, p. 45) Ex: Ask participant to name 3 things that can fly [a bird, a plane, a bee]. Name 3 girls names, 3 tools or kitchen gadgets etc.

DIFFICULT

1. Discuss current events from newspaper. Read an article from the newspaper. Ask the participant what they think of it. Do they agree or disagree?
2. Play "Price is Right" Ask participant to arrange items (food, tools, etc.) in order of price. Ex: Place a box of noodles, a jar of Peanut Butter and a can of Coffee in front of the participant. Ask them to put the items in order from lowest price to highest.
3. Discuss the meaning of a poem. Read a poem. Ask the participant what they think the author is talking about.
4. Explain Idioms (Brain Fitness, p.38) or Book of proverbs- ask participant to explain (ex. "A stitch in time saves nine" what does that mean?).
5. Who Done It? Solve the mystery in a short story. Read a story, giving clues, and ask the participant who they think did it. Why?
6. Brain Quest- Math problems. Ask the participant to solve simple math problems of addition and subtraction. Ex: Jane had 4 pies for Thanksgiving, her guests ate 2. How many pies?

Interventions for EXECUTIVE FUNCTIONING

EASY

1. Categories: give participant a category and have them name three more items in that category. Ex.: use Fruit as the category, have the participant name 3 fruits, such as apples, bananas, and pears. [other categories can be pies, clothing, girl's or boy's names, tools etc.].
2. Sort items by color/shape. Use the foam shapes or wood block shapes. Ex: Give the participant an assortment of shapes in different colors. Ask them to pick out all the triangles [or squares, circles etc.]. Ask them to pick out all the yellow shapes, ask them to pick out all the yellow triangles. Vary the shapes and colors.
3. Complete an easy puzzle or peg board game. Ex: Place the puzzle pieces on the table. Tell the participant what the puzzle is a picture of and ask them to piece it together.
4. Sewing cards. Ex: Give the participant the sewing card and yarn. Ask them to put the yarn into the holes on the outer edges of the card .Ask them to knot the yarn to keep it in place.
5. "Work" apron with zipper, tie, buttons and velcro. Ex: place the apron before the participant. Ask them to open and close the zipper, tie the laces, close the button holes, and secure and release the Velcro.
6. Game of Set- can be made easy, moderate or difficult- sort cards by shape, color and/or number on each card. Ex:.Ask the participant to sort the cards by color {red] Then ask them to sort the red cards with the number 3. .

MODERATE

1. Use the foam shapes or wood blocks to create pictures or flowers. Ex: put all the shapes before the participant. Ask them to create a picture or flower using the colorful shapes. Start to shape a flower of your own to get the participant started.

2. Use craft supplies to make a scrap book .Ex: use construction paper, cut pictures from magazines that interest the participant [flowers, jewelry] have participant group the items on a page and glue them down .Tie the pages together using a hole puncher and yarn.
3. Calculate change for a purchase. Ex: Using real money, have the participant pick a labeled item she would like to" buy" [grocery item, hair care item, tools] Tell the participant the price of the item and have them count out and pay the correct amount..
4. Discuss how to organize (plan) a Cooking project/ wood making project. Ex: say" I would like to bake a cake" what shall we do first? [go to store, buy certain items, get a mixing bowl and spoon. Put batter in pan, bake at 350 for 30 minutes]

DIFFICULT

1. Play Hangman (Brain Fitness, p.136).
2. Write a letter to a friend. Ex: ask the participant to whom they would like to write a letter. Date the letter, start with " Dear Jane." Then ask the participant what they would like to tell or ask the person they are writing to. Finish and sign.
3. "I Spy" Match game Ex: hold a picture in front of the participant. Ask if they can find an item in the picture. [can you see a basket in the picture?] choose easy to find items first, getting more difficult as you progress.
4. Wheel of Fortune game.
5. Tool box (for a male) with items in it (discuss items and how you use them) .Ex: put the toolbox in front of the participant. Ask them to pick out an item from the box [hammer], ask what the item is, ask how the item is used.
6. Using foam shapes. Set out 3 or 4 shapes in different colors. Ask questions: are all the circles blue? are all red shapes stars? how many squares? (more difficult: how many red squares?)
7. Scrabble letter blocks (make words with wooden letters). Ex: using the Scrabble letter blocks, ask the participant to form a word , name or phrase.
8. Complete the Maze. Ex: give the participant a pencil, ask them to find the beginning of the maze and draw a line into the maze to the end without crossing over a solid line.
9. Name 3 of a kind in a category (ex. flowers, girls' names etc.) Ex: pick a category [colors] have the participant name 3 items in that category [red, blue, pink]
10. Advanced Dot to Dot (connecting both letters and numbers simultaneously). Ex: have the participant draw a line connecting number 1 to 2 to 3 etc. and also the letters A to B to C etc.
11. "Name 3 (of a kind)": flowers, baking utensils, tools, girls names, boys names, animals, toys. This can be increased in difficulty by increasing the number in each category to identify. Ex: have the participant name three kinds of flowers [rose, daisy, tulip]
12. Crossword puzzle. Tell the participant that you are doing a crossword puzzle. Read the clue for the first line and ask the participant what they think the answer is…write the correct answer in the blocks.

ACADEMIC VITAE

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EDUCATION:

- Bachelor of Science in Nursing with Honors
    - The Pennsylvania State University, College of Nursing, Schreyer Honors College, University Park, PA
- *Thesis Title* – Association of Delirium and Physical Function to Engagement in Cognitively Stimulating Recreational Activities in Patients with Delirium Superimposed on Dementia
  Thesis Supervisor – Harleah G. Buck, PhD, RN, CHPN, FPCN

SCHOLASTIC ACHIEVEMENTS:

- The Pennsylvania State University Dean's List all academic semesters
- Annual P&G Mehoopany Employees Federal Credit Union Student Member Scholarship, 2013-2015

ASSOCIATION MEMBERSHIPS:

- Honor Society of Nursing, Sigma Theta Tau International, Beta Sigma Chapter
- Pennsylvania State Chapter of the National Society of Leadership and Success
- Phi Eta Sigma National Honor Society at The Pennsylvania State University
- National Society of Collegiate Scholars
- Student Nurses' Association of Pennsylvania (SNAP), Penn State Chapter

PUBLICATIONS:

- 33rd volume of *Penn Statements: A Magazine of Student Writing from Rhetoric and Composition*

CLINICAL EXPERIENCE:

- The Pennsylvania State University, University Park, PA and Hershey, PA
    - Nursing care of the adult client with complex health problems, mental health nursing, community and family health nursing, nursing care of children and adolescents, nursing care of the childbearing family and gynecologic client, nursing care of the medical-surgical client, nursing care of the older adult, fundamentals of nursing care
- Clinical Capstone: Hershey Medical Center, Pediatric Intensive Care Unit

WORK EXPERIENCE:

- YMCA Camp Kresge
  In the summer of 2015, I was a Day Camp Senior Counselor/First Aid Leader. Programs I took my group of young campers (5-6 year olds) to included: swimming in the lake,

boating, arts and crafts, team building, hikes, etc. I also tended to those who had medical needs, such as diabetes.

RESEARCH:

- Undergraduate Thesis in Delirium Superimposed on Dementia: The Association of Delirium and Physical Function to Engagement in Cognitively Stimulating Recreational Activities in Patients with DSD
    - *Advisor:* Harleah G. Buck, PhD, RN, CHPN, FPCN
    - Managed data from parent study, planned analysis, interpreted results
- Shaping the Future Summit
    - *Supervisor:* Darlene Clark, M.S., R.N.
    - Studied the interaction of ethical, legal, and genetic issues as they apply to health care organizations
    - Facilitated a discussion focused on global issues and leadership scenarios, particularly related to "The Power of Money" in organizations that influence health care practice

COMMUNITY SERVICE INVOLVEMENT:

- Student volunteer
    - The Pennsylvania State University IFC/Panhellenic Dance MaraTHON
    - Social skills program for adults with Autism Spectrum Disorders
    - Ronald McDonald House
    - The Pennsylvania State University Flu Clinic
    - The Pennsylvania State University Blood Drive
    - Student Nurses' Association of Pennsylvania Career Fair at The Pennsylvania State University
    - Team leader at Cross Creek Community Church Vacation Bible School
    - Mother Theresa Haven