

The Memory Club

Incorporating Games from the Childhood of Elderly Armenians into the Memory Club to Improve Cognitive Function and Decrease Anxiety



Abstract

Alzheimer's Care Armenia created the Memory Club to slow the progression of memory loss in the elderly. Our project aimed to incorporate participant's childhood games into the Memory Club; to decrease anxiety and enhance their quality of life by improving their overall cognitive functioning. To accomplish our goal, we researched popular Armenian childhood games, evaluated each game for cognitive benefits, and assessed the results. The success of the program was measured using two standardized tests: the Montreal Cognitive Assessment (MoCA) and Geriatric Anxiety Scale 10 Item (GAS-10). The tests were given to the participants and a comparison group before and after the program. The average difference in the MoCA test was -0.5 for the participants and 1.35 for the comparison group. Based on inconsistencies found, the MoCA test results were inconclusive. The GAS-10 was successful; the participants and the comparison group had an average difference of -0.09 and 0.9 respectively. The Memory Club saw changes in the participants' behavior, emotions, and mental state and was deemed a success.

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WPI

Alzheimer's Disease Is a Global Problem That Is Profoundly Impacting Armenia

Alzheimer's disease has an impact on every race, sex, and ethnicity, affecting 42 million people worldwide, including one out of nine people over the age of sixty-five. Two-thirds of these people live in developing countries and do not possess the knowledge about Alzheimer's disease and its effects on the brain.¹ Armenia, being one of these countries, is in danger of a crisis. An estimated 20,000 to 30,000 people above the age of sixty-five in 2012 have been diagnosed with Alzheimer's in Armenia, after Alzheimer's recently became a diagnosis in 2006.²

Alzheimer's disrupts one's ability to recall memories, deteriorates one's thoughts and emotions, and causes symptoms that are unrelated to memory loss, such as anxiety and depression. One study showed that more than 70% of the patients experienced anxiety symptoms and more than half also experienced symptoms of depression.³

While there is no cure for Alzheimer's disease, researchers are creating innovative ways to help patients cope and slow the progression of this degenerative disease. One study described the improvements that playing games and participating in activities can have on the quality of life of people who experience memory loss. Games and other activities stimulate brain function, while also allowing for social opportunities. Socialization is

important for reducing symptoms of depression. Many support groups and programs for Alzheimer's patients and their caregivers have been developed to relieve stress and improve education.

The mission of Alzheimer's Care Armenia (ACA) is to raise awareness and offer solutions for the care and treatment of people with Alzheimer's disease in Armenia.⁴ Dr. Jane Mahakian, ACA founder, created the Memory Club, an eight-week program that meets for two hours every week at the Orran Center in Vanadzor, Armenia as a way to combat memory loss. Each weekly session was broken down into three core elements (Figure 1). This included a discussion, where the participants could open up about their memory loss struggles, a game meant to reduce anxiety and help stimulate cognitive development, and an art and craft activity used to promote motor-skill development.

Our IQP team incorporated participants' childhood games into the Memory Club program to decrease anxiety and enhance their quality of life by improving their cognitive function.

The team:

- Determined the most popular/impactful Armenian childhood games between 1940 and 1970.
- Determined the potential for cognitive and therapeutic benefits of the games and the advantages of the arts and crafts used in the Memory Club.
- Paired the games with the arts and crafts that have the maximum potential for benefits and implemented them into the Memory Club.
- Developed a plan for each session of the Memory Club, and evaluated for further improvement in the following sessions based on data collected.
- Determined what the participants hoped to gain from the Memory Club.
- Assessed the differences in cognitive function and anxiety levels before and after the program in both the participants of the Memory Club program and a comparison group.
- Compiled data to make recommendations for future Armenian Memory Clubs.

The Montreal Cognitive Assessment (MoCA) was used to determine if the program had positive effects on cognitive function, and the



Figure 1: Memory Club Core Elements

Geriatric Anxiety Scale 10 Item (GAS-10) was utilized to measure changes in anxiety. The Memory Club aims to improve lives and demonstrate memory clubs are an effective and enjoyable way to combat memory loss.

Memory Loss Causes Daily Life to Become Difficult

Memory loss is characterized by abnormally high levels of forgetfulness, as a result of aging or illness. Memory loss is common in old age and can cause one to forget a person's name, or where something was last placed. Small changes such as these tend not to affect daily living, however, they can also be indicators of a more serious disease.⁵ Memory loss can be degenerative, making it difficult to carry out normal tasks leading to a loss of independence. Being dependent on others, losing self-awareness, and the deterioration of the brain can further induce psychological conditions such as anxiety and depression.³

When daily living is affected, memory loss is considered a disease. A few memory loss diseases are amnesia, mild cognitive impairment, and dementia.¹ Alzheimer's disease is a type of dementia and accounts for 60%-80% of all cases, shown in Figure 2.⁶ Descriptions of other forms of dementia can be seen in Table 1.

Alzheimer's disease is caused when proteins in the brain are not broken down properly, and clump together, interrupting neuronal connections.⁶ If one connection is interrupted, then that chain signal is broken and the message isn't

Table 1: Different Kinds of Dementia⁷

Alzheimer's Disease	Causes problems with memory, language, and reasoning. 5% of cases start before the age of sixty-five.
Vascular Dementia	Impaired judgment, difficulty with motor skills and balance. Heart disease and strokes increase its likelihood
Mixed Dementia	Several types of dementia contribute to symptoms. Most common in people over eighty-five.
Dementia with Lewy Bodies	Caused by Lewy Body proteins. Symptoms can include hallucinations, and disordered sleep.
Frontotemporal Dementia	Personality changes and language problems. Most common onset between the ages of forty-five and sixty.
Parkinson Disease	Can give rise to dementia symptoms as the condition progresses.
Other	Conditions such as Creutzfeldt-Jakob disease, depression, multiple sclerosis, etc.

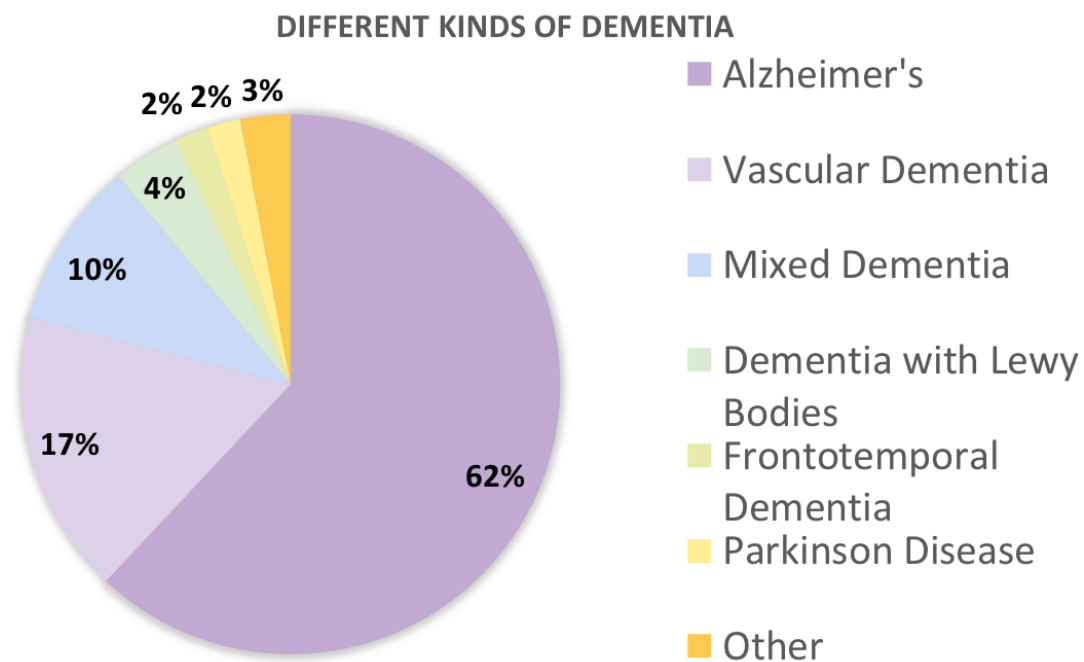


Figure 2: Different Kinds of Dementia⁷

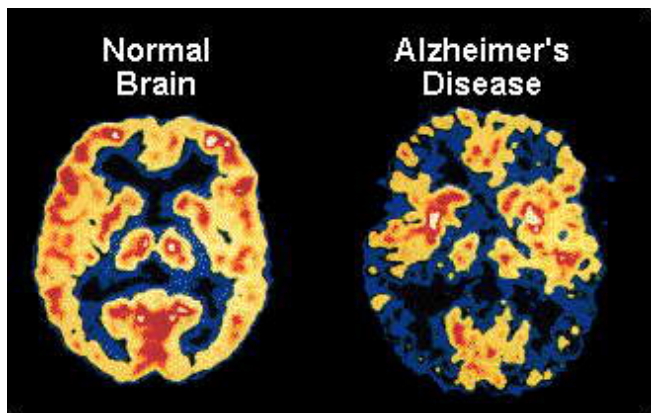


Figure 3: Differences in Metabolic Activity in the Brain⁸

transmitted. If neuronal communication is broken, thinking, behavior, and emotions will be disrupted.⁶ Damaged neurons can no longer be used, which further decreases brain activity.⁸ Differences in active brain tissue between a healthy brain and a brain with Alzheimer's can be shown through PET scans, represented in Figure 3.

Alzheimer's slowly worsens cell communication, impairs brain function, and causes daily activities to become challenging by deteriorating the individual's everyday thoughts.⁹ Brain cells are damaged first in the hippocampus, which is where memories are stored. Eventually, this disease disseminates throughout the brain, affecting one's emotions, logical thinking, and language skills. This makes it more difficult to perform everyday activities and impairs self-efficacy.

Alzheimer's disease can also cause a loss of independence. The effects of the disease such as memory loss, confusion, loss of emotions, makes it difficult to care for oneself.¹⁰ Individuals with Alzheimer's disease, or severe memory loss, feel a loss of independence and frustration when

daily tasks cannot be carried out by oneself. "Loss of skills and dependence on others can lead... to the loss of a sense of dignity, self-worth and eventually to a state of helplessness."¹¹ A loss of independence can contribute to depression, and it's not uncommon for a patient to develop depression and anxiety after being diagnosed with Alzheimer's.³

Anxiety affects working memory, which is the aspect of one's brain that holds and manipulates information. Research has shown that anxiety affects the way one's mind selects a behavior that it thinks is appropriate and rejects behaviors that it deems inappropriate.¹² Anxiety also causes the brain to focus on mistakes rather than successes. In this way, anxiety can create a loop of focusing on mistakes, making uninformed decisions, and focusing on the mistake as a result of that decision. Anxiety also reduces cognitive function, as does having Alzheimer's, therefore if a patient with Alzheimer's also experiences anxiety, their brain functions at a much lower level.¹³ Alzheimer's is an untreatable disease; however, anxiety is treatable and severity can be reduced if not diminished completely. Reducing the anxiety of Alzheimer's patients will improve the patient's quality of life.

GLOBALLY THE NUMBER OF PEOPLE LIVING WITH DEMENTIA WILL INCREASE FROM 50M TO 152M IN 2050, A 204% INCREASE

The Number of People Suffering From Dementia Is Rapidly Increasing On a Global Scale

A recent estimate suggests that dementia affects approximately 42 million people globally.¹⁴ However, given the increasing number of older adults, it is projected that this number is expected to grow to approximately 152 million people by the year 2050, as shown in Figure 4.¹⁵ Due to the rising disease rate, many organizations have taken action to raise awareness of Alzheimer's disease.

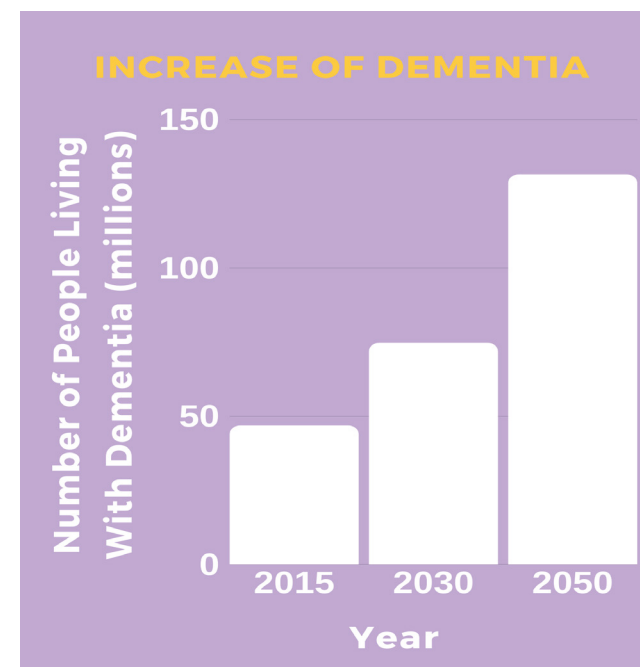


Figure 4: Increase in Dementia Globally Over Time¹⁵

There are few resources in Armenia to address Alzheimer’s disease and not everyone is directed to the right resources or is correctly diagnosed with Alzheimer’s. Most assume the symptoms are due to mental illness or simply part of old age. Dr. Hovhannes Manvelyan, chairman of the Yerevan State Medical University Neurology Department, is one of the few neurologists in Armenia who specializes in Alzheimer’s disease. In an interview he explains, “When I came to Armenia from the U.S. in 2006, we didn’t even have an Alzheimer’s disease diagnosis... All these cases were accepted as a normal part of aging—from abnormal living, to forgetting, to depression.”² Organizations in Armenia are working to find ways to combat this disease. ACA specifically is using childhood games, and arts & crafts, to decrease its effects with a unique Memory Club pilot program.

Playing Games is a Productive and Beneficial Activity for Those Suffering from Memory Loss

Playing stimulating leisure activities like board games have been shown to have long term cognitive benefits.¹⁶ Some of these cognitive benefits are slowed memory decline, decreased chance of depression, and a lower chance of developing severe forms of memory diseases. These cognitive benefits of playing games have been displayed in multiple studies. A 2012 French study surveyed board game players and followed

up after a time period of twenty years. Avid and regular board game players were 15% less likely to develop dementia when compared to those who did not regularly play board games.¹⁶ Over the period of twenty years, board game players also showed less decline on memory test scores, and lower incidence of depression, compared to those who did not play board games.¹⁶ Board games are a brain strengthening activity that is enjoyable and extremely beneficial.

Another recent study¹⁷ showed that young adults (eighteen to twenty-four) and older adults (sixty+) who played video games showed the highest improvement in neurological tests. These tests evaluated a series of the participants’ different cognitive elements as seen in Figure 5; including processing speed, visual training, attention, and memory.¹⁷ Video games were an excellent example of an activity that was joyful and showed benefits in all areas of cognition.

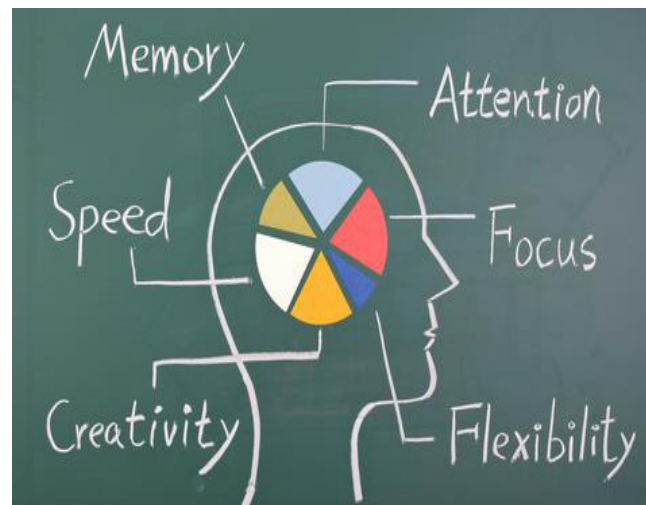


Figure 5: The Benefits of Games on the Brain¹⁸

Jigsaw puzzles are another example of a fun activity that strengthens brain skills and improves memory. Seniors who have Alzheimer’s need to do activities that stimulate cognitive functioning and puzzles get both the brain working and allow for social opportunities.¹⁹ This activity helps pass the time and promotes social interaction while strengthening the brain. In addition, a recent study²⁰ of the effects of different activities on cognitive and visual-spatial performance revealed that seniors with memory loss who worked on puzzles showed improvement in their short-term memory. Jigsaw puzzles are an inexpensive, fun, and proactive solution to combat the effects of memory loss.

The benefits seen in board games, video games, and jigsaw puzzles noted above can be also be seen in the game chess, which has the added benefit of being popular in Armenia. The country went as far as making chess a mandatory class for students in primary school.²¹ “School officials in Armenia say the move is aimed at fostering independent strategic thinking among future generations at school, at work, and in society.”²¹ Chess is a game that has the potential to hold a lot of benefits for those who experience memory loss because of its cognitive skill and traditional roots.

Armenian childhood games often resemble folk games. Folk games are played across different cultures and often passed down via “word of mouth”. These folk games are present in Armenian culture, with their own Armenian titles. Folk games that are played by children in Armenia require minimal materials or supplies, which is

appealing for lower-income families, who can't afford to buy expensive games. Traditional Armenian games that are familiar to the participants require social interaction and promote brain stimulation, and therefore have the largest potential of helping reduce the participants' anxiety and increase cognitive function.

Arts & Crafts Have Therapeutic and Cognitive Benefits

In order to create the most beneficial experience for the participants of the program, the team paired the games with the arts and crafts. Art and crafts, in comparison to games, usually don't have a winner and clearly outlined rules. Studies have shown that a routine usage of arts and crafts have the ability to boost the confidence of the participants, develop motor skills, and inspire creativity.⁴ A recent study²² looked at 256 people between the age of eighty-five and eighty-nine years old with no memory impairment. The study's goal was to follow the lifestyles of each elderly person, to see who showed a cognitive decline over time. The participants of the study had to report all their independent artistic endeavors over a period of four years. These activities were "painting, drawing, sculpting, woodworking, ceramics, quilting and sewing."²² The study concluded that, "People who exercised their artistic muscle were 73% less likely to develop mild cognitive impairment, a condition that can mean memory problems and reduced mental function, than those who didn't partake in artistic activities."²² They concluded

that, "preventive strategies for MCI (mild cognitive impairment) may need to begin in midlife and should persist throughout late life."²³

Music is beneficial and therapeutic to those affected by memory loss disorders. "Music has the power to provide the Alzheimer's patient with a sense of accomplishment, to energize and stimulate, to trigger words, and to soothe and comfort both the patient and caregiver."²⁴ Music, combined with other stimulating activities and games, can have a large impact on improving the cognitive function in Alzheimer's patients, especially if paired with a game or activity from the participant's childhood.

Standard Assessments Measure Cognitive Function and Anxiety

The Montreal Cognitive Assessment, also known as the MoCA test, is a fast screening for mild cognitive dysfunction. Note that this test is not a diagnostic tool, rather a way to assess the severity of the problem. The MoCA tests visuospatial/executive function, naming, attention, language, abstraction, delayed recall (short-term memory), and orientation.²⁵ The MoCA test has many benefits as a cognitive function screening tool, including short and easy administration, clear scoring guidelines, and simple interpretation of results. In addition, it does a better job of accurately assessing the participant's cognitive function than other cognitive function tests. It is reliable and analyzes more categories of cognitive function than other tests like it, such as the Mini-Mental State

Examination, or MMSE. In addition, the MMSE only assesses five aspects of cognitive function²⁶ while the MoCA assesses seven.

Anxiety is common in patients who experience memory loss for many reasons, including social isolation. Changing levels of anxiety can be assessed using the ten-item version of the Geriatric Anxiety Scale (GAS). The GAS "possesses strong convergent and discriminant validity and shows promise as a measure of anxiety in older adults."²⁷

A Memory Club Is Needed To Help Alleviate the Problems Associated With A Rising Population of People with Alzheimer's

As modern medicine advances and the population of people over sixty-five years old increases, a larger supply of stimulating activities is necessary to reduce mild cognitive impairment (MCI) and ultimately dementia. With dementia care being extremely expensive, caregivers and patients are looking for inexpensive and effective alternatives to cope with MCI. The goal of the Memory Club is to create a safe, inviting, and trustworthy place where the participants can build their cognitive abilities once a week, to strengthen their brain and deter memory loss as they age.

EVERY 65 SECONDS SOMEONE DEVELOPS ALZHEIMER'S

Developing a Procedure for Game Implementation into Memory Club Program

This project consists of three major work streams: researching games, evaluating games, and assessing results. Games were researched and evaluated simultaneously throughout the program.

The assessments of the program were given at the beginning and end. A visual outline of the methods can be seen in Figure 6.

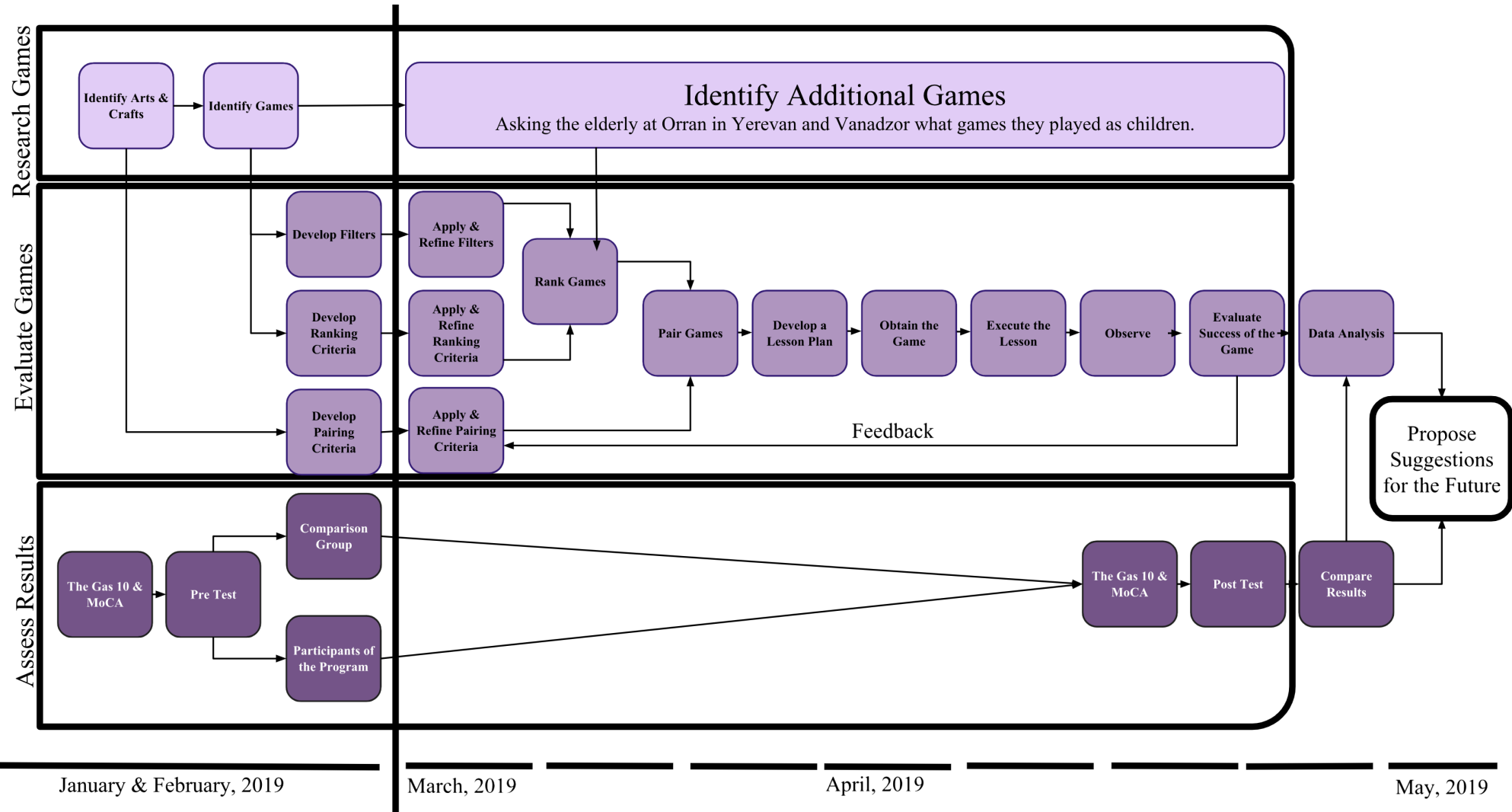


Figure 6: Approach Diagram

Community Outreach was the Most Successful Way to Identify Armenian Games

The pleasure of playing a childhood game and anxiety reduction are linked.²⁸ Childhood games were introduced to the Memory Club in an effort to reduce anxiety in the participants. To find games from the participant's childhood, which was from the 1940s to the 1970s, community outreach as well as online research was conducted. We spoke with Armenian students on campus, posted on Facebook pages, and visited an Armenian church. The pursuit to identify childhood Armenian games was continued by asking the participants of the program and the elderly who came to the Orran Center in Yerevan to identify

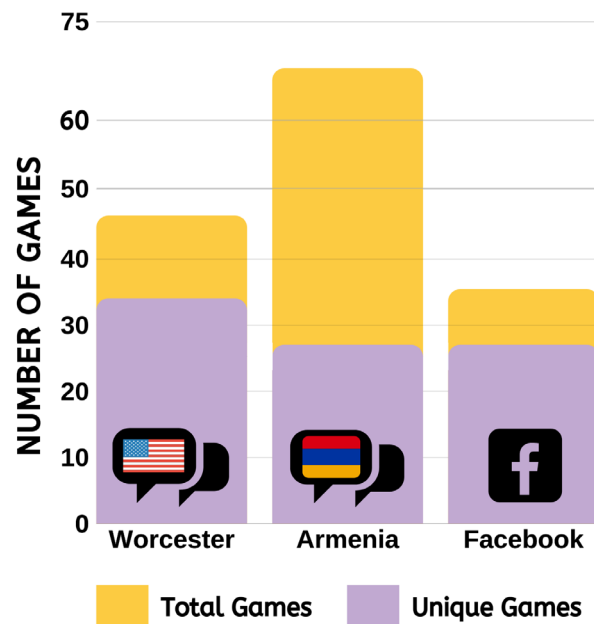


Figure 8: Game Findings

games they played as children. The number of responses and number of unique games collected from each source are shown in Figure 8. Games without information about them were excluded from the list. To find games that the majority of the participants would be familiar with, as many different outlets as possible were utilized.

Sources in Worcester and Orran were able to provide information about the rules for each game, and whether they had been popular in the 1940-1970 time frame. Many different games were able to be identified from Facebook, however, we were unable to use most of the games that were suggested because the Facebook posts did not have descriptions of the game, and it was unknown if the game was played in the desired time frame. Therefore, speaking to Armenian community members was the most effective way to identify Armenian games. In total, thirty-two unique games were found that were considered for implementation into the program. Information about each game that was implemented into the program, as well as findings from each session, can be found in the supplemental materials.

Filters and Scaled Items Were Developed to Assist in Game Selection

Criteria were developed to select the most beneficial games for the program. These criteria were based on the program objectives and limitations, as well as the impairments of Alzheimer's and old age. After an initial list of criteria was developed, they were split into two separate

categories: filters and scaled items. Whereas the scaled items were used to rank the games on a four point scale, the filters were criteria that were used on a pass or fail basis. The filters focused mainly on aspects of playing and facilitating a game. The filters were general availability, time, cost, feasibility, difficulty, and physicality.

General availability meant it was easy for a participant to play the game outside the program. This included borrowing it from Orran, making their own, or purchasing it. The simplest filters were time, cost, and feasibility. There had to be enough time in the program to play the game. In addition, a game could not be expensive. Feasibility considers the space and materials needed to play a particular game. The participants should be offered a challenge because it enabled them to build skills and confidence over time. However, the game could not be too challenging or the participants would not play it, which was the logic behind the difficulty filter. Physicality was an important filter; the participants had to be able to play the game. Due to limited participant mobility, the selection of games considered the limitations of the participants. The level of mobility was observed on site. Games that were deemed too physical were adapted into less physical versions to fit the needs of the participants or excluded entirely.

Games that passed through the filters were ranked using scaled criteria. These scaled items allowed the team to pick games that would best support the goals of the program. The scaled items were familiarity, enjoyability, consideration of the participants' impairments, and social interaction.

The game had to be familiar to the

participants, as well as fun to play. If a game was dull, the participants would grow bored and would not experience the positive effects of the game. Participants with impairments in vision, hearing, or who have limited fine motor skills should be able to play the game. Finally, games that incorporate more social interaction can decrease symptoms of stress and depression, form a sense of community, and increase the feeling of joy. Each of the scaled items were ranked on a four point scale. A rubric for each of the scaled items can be seen in the supplemental materials.

When looking at each of the scaled items, the team believed that not all of the scaled items had equal importance. For example, games that encouraged high levels of social interaction were more important than games that were familiar to the participants. The weights of each scaled item were discussed with Dr. Jane using a pairwise comparison method for game selection. The pairwise comparison chart can be seen in the supplemental materials. The team created spider charts to visualize how well each game met each of the scaled items.

Games that Passed Through the Filters Were Ranked Using the Scaled Criteria

To evaluate a game, each scaled item's score was multiplied by its weight to obtain the weighted score. All four weighted scores were added together for the total score. For example, the ranking for "Broken Telephone" can be seen in

Table 2: Ranking Example for Broken Telephone

Scaled Item	Description of Scoring	Score	Weight	Weighted Score
Familiarity	The game is recognized by most of the participants.	3	0.5	1.5
Enjoyability	The game is enjoyed by all participants.	3	2	6
The Participants' Impairments	The game considers all three impairments.	2	0.5	1
Social Interaction	The game is played as a whole group.	3	3	9

Table 2. A full list of games and their rankings can be found in the supplemental materials.

Games Were Paired with Complementary Arts and Crafts

While the team was in charge of implementing the most beneficial games into the program, another party was in charge of organizing arts and crafts for the participants. These arts and crafts included painting, drawing, and ceramics. The team decided to pair the games and arts and crafts in a complementary fashion, such that the participants could experience all aspects of the activities that would assist in increasing cognitive function and decreasing anxiety. For example, the arts and crafts are traditionally individual activities, therefore, the game should provide an opportunity for social interaction. Each of the arts and crafts were ranked using the scaled items criteria.

The arts and crafts were different from week to week, but had similar rankings within the scaled items, so multiple games were found that paired well with those arts and crafts. Spider charts were used to visually compare how well the arts and crafts activity and the game complemented each other on the scaled items. An example of a spider chart for both a game and an arts and

Broken Telephone & Ceramics

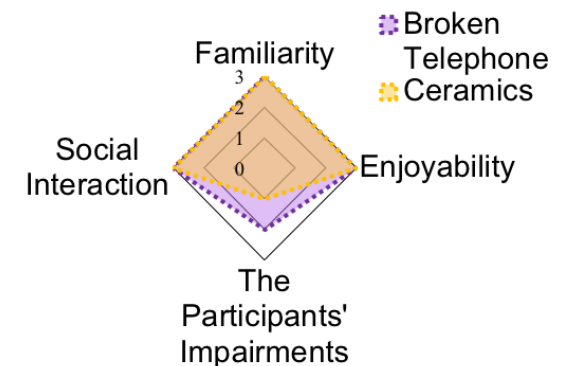


Figure 7: The Game and Arts & Crafts Activity Overlapped

crafts activity can be seen in Figure 7. The game and the arts and crafts should cover as much of the spider chart as possible. A perfect pair would have the entire spider chart shaded in.

Each Memory Club Session Was Comprised of Three Key Components

Most participants of the Memory Club ate lunch at the Orran Center prior to attending each weekly session. After lunch, every session began with a discussion to build a sense of community and create a positive atmosphere among the participants. In addition, the discussion was used to gauge the overall success of the program, and receive feedback from the participants. The staff at Orran provided a translator for each session, who was instrumental in relaying information between the team and the participants.

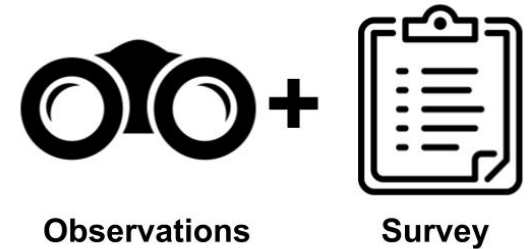
After the discussion, the Memory Club started the game portion of the program. Here the rules were explained to the translator who explained the game to the participants. We were responsible for facilitating the games, and sometimes played the games with the participants. After the games and a short snack break, the arts and crafts portion of the program began. Each art session had a designated instructor who was responsible for directing the participants and leading the session.



Figure 8: The Memory Club Components

The Games Were Evaluated in Two Different Ways

An observation protocol, which can be found in the supplemental materials, was used to obtain perspective on participants' enjoyment of the games. Time sampling was chosen as the main observational method. It allowed specific behavioral occurrences to be recorded at predetermined time intervals throughout the game portion. Time sampling was chosen because it takes less time than running or anecdotal records, the observer can record many people at once, it provides useful information for the frequencies of each behavior, and it provides quantitative data.³⁰ Disadvantages to time sampling include missing important behaviors, the context of each behavior is not noted, and rare behaviors are not noted.²⁹ In order to avoid these disadvantages, the time sampled observations were supplemented with anecdotal observations to note more rare behaviors. In addition, based on the time intervals, the context of each of the behavioral occurrences can be inferred. During weeks one and two, only anecdotal information was recorded. During weeks three and four, the observation protocol and number of observers was changed to find the most suitable conditions for the study. From the fifth week onward, two team members were designated to observe each week, and did not interact with the participants. Their job was to look for specific behavioral cues of enjoyment and displeasure such as laughing, smiling, and refusal to participate, and record how many instances of each occurred at each time interval. Furthermore, the translator



was utilized to understand what the participants were saying.

The second way the team evaluated success was through an Enjoyment and Familiarity Survey which can be found in the supplemental materials. After the participants played the game in each session, the survey was used to measure its success. The results of the surveys and observations were used to reevaluate the game's ranking on the scaled items, if necessary, and help make plans for the future. The enjoyability and familiarity rankings were scored based on predictions from the team prior to the game being played. The results from the survey were used to score these scaled items more accurately for future use. In addition, the survey asked whether or not the participants would like to play the game again. These responses helped determine which games should be implemented into future programs. The observations were used to make improvements as well. For example, on the first day of the program, the employees at Orran suggested a snack break because the participants get tired. We recognized that this was a good idea, and budgeted time for a snack break into the schedule thereafter. Subtle changes such as this one assisted in making the program more successful.

Changes in Participants' Cognitive Functioning and Anxiety Were Measured Using Two Standardized Assessments

The overall goal of the Memory Club is to decrease anxiety in the participants and enhance their quality of life by improving their overall cognitive functioning. Prior to the beginning of the program, the participants were given the Montreal Cognitive Assessment³² to measure their level of cognitive function, and the Geriatric Anxiety Scale 10 Item³¹ to measure their level of anxiety. These tests were used as a baseline, and the same tests were given again at the end of the program to see if there was any measurable change. Each test was conducted after obtaining the informed consent of the participant. All scores were kept confidential and only aggregate data were published.

The MoCA is scored out of thirty points where twenty-six or above is considered normal cognitive function. The GAS-10 asks questions using a Likert scale³¹ and is scored by summing the totals. The raw scores range from zero to thirty. A raw score of six or less on the GAS-10 suggests minimal anxiety levels. The raw score is used to find a T-Score which places the participant into a percentile range that corresponds with a category of the severity of their anxiety. If the raw score does not have a respective T-Score, it will be rounded up to the nearest one. The categories

and respective T-scores are: minimal (21-63), mild (70-82), moderate (90), or severe (95-99).

Each of the assessments hold a purpose in the Memory Club. The MoCA test assesses seven different areas of cognitive function. The most important areas reviewed were delayed recall and orientation. Over the course of the program, cognitive function was expected to increase in order to potentially delay the symptoms of memory loss. Furthermore, the GAS-10 provided a clear and unbiased scoring system to clearly see the participants' change in anxiety over the course of the program. These assessments are reliable and trusted tools that were used to properly analyze the program as a whole.

Changes in cognitive function or anxiety can be attributed to many different experiences. In order to attribute the changes in cognitive function and anxiety in the participants to the Memory Club, a comparison group was utilized. The comparison group was comprised of volunteers from the Orran Center in Yerevan. These volunteers were around the same age as the participants of the program and did not participate in the Memory Club or any similar program. These participants were administered both a pre and post test of both the MoCA and the GAS-10. The changes in the comparison group's results were compared against the changes in the participants' test scores to evaluate the success of the Memory Club.



MoCA Test



GAS-10

The MoCA and GAS-10 Scores Were Inconclusive

Figures 9 and 10 show the change in test scores for the participants and the comparison group. The scores of the participants who were absent more than once were excluded from the data set when calculating averages. The average difference between the pre and post-tests for the participants of the program was -0.5 and the average difference for the comparison group was 1.35, out of a possible score of 30. The difference is not statistically significant. Seven of the participants' pre-test scores scored within the normal cognitive function range (26 or higher) and four scored below normal cognitive function. Out of the seven who scored normal cognitive function, six of them did worse on their post-tests; however, three out of the four who scored below normal cognitive function on the pre-test improved on their post-test.

Some differences in test scores may have been due to inconsistencies in scoring the tests. For instance, one of the sections was completely blank for all of the participants on their post-test, but not on their pre-test. Proper scoring for the delayed recall section awards points only for uncued responses. However, the score sheets indicated that points may have been awarded for cued responses. For future studies, experienced administrators and consistent testing is crucial to obtain accurate data. Furthermore, the short duration of the Memory Club pilot may not have been long enough to see any measurable change. In

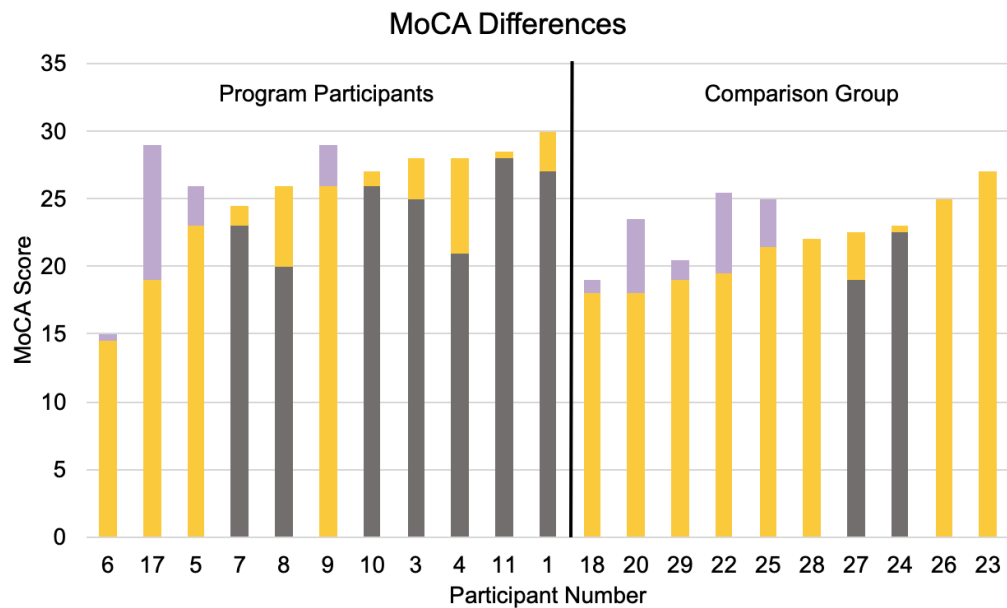


Figure 9: MoCA Differences

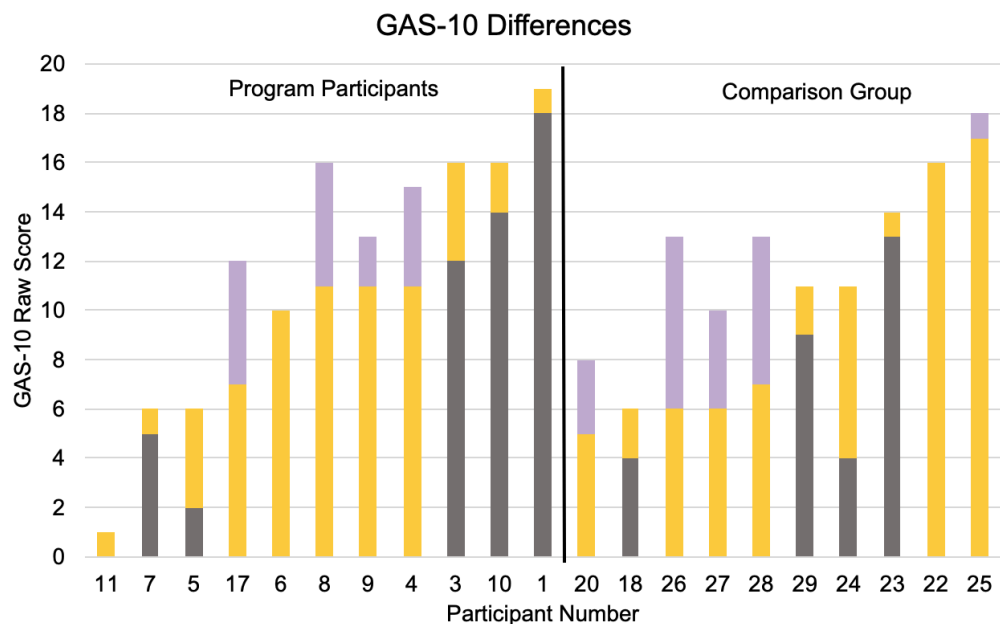


Figure 10: GAS-10 Differences

future studies, the number of sessions before the post-test is administered should be larger. More frequent session may also help to improve the participants' cognitive function. Based on these factors, the results of the MoCA test were inconclusive.

The results of the GAS-10 were much better. The participants of the program had an average difference in pre and post-test scores of -0.09 (out of 30) and the comparison group had an average difference of 0.9. The difference is, again, not statistically significant. However, we noticed significant behavioral changes over the course of the program. Participant 6 [Figure 11 and 12] showed the largest behavioral change over the course of the program. During week one, Participant 6 needed guidance to begin everything, never smiled, and didn't speak at all. By week five, Participant 6 was greeting the team members, participating without a prompt, and making jokes with the rest of the participants. Another participant never smiled until week six, and then she began to smile much more often while playing games with her friends.

Behavioral changes such as these made the Memory Club a success. While the cognitive function of the participants didn't increase as expected, their quality of life improved. The Memory Club allowed the participants to feel a sense of community, build relationships, and create something that they're proud of. The Memory Club was a unique and rare opportunity for the elderly, majority of whom live alone, to socialize and play games with friends. They were generally happier,

more engaged, and more involved. Over time, these changes in emotion, behavior, and mental state are expected to improve their cognitive function and continue to improve their quality of life.



Figure 11: Participant Week 1



Figure 12: Participant Week 5

Successful Games Are Familiar to the Participants and Are Competitive

The games that had these characteristics were lotto, dominos, checkers, zelena (similar to musical chairs), and jigsaw puzzles. On the survey at the end of each session, every participant said they enjoyed each of these games, would like to play each of them again, remembered each one from their childhood, and had played every game previously. Figure 13 shows these results for checkers.

While the participants were playing dominoes, they played with a rule that was not explained in the instructions. After speaking with the translator, the rule they followed was common in Armenia. These participants remembered the rules from their childhood and it took minimal effort for them to begin playing. Once the game zelena (similar to musical chairs) was introduced, the participants quickly remembered the song that went along with the game. The only game out of these five that all the participants said they had not done before was jigsaw puzzles. Four out of the twelve participants who attended the puzzle session said they had never done them before and didn't remember them from their childhood. Nonetheless, none of the participants needed help understanding that they needed to put the pieces together.

Competition caused the participants to be more engaged in the game. Zelena included competition, since the last one to complete the action

was eliminated. The participants were getting competitive and pointing out who they thought was last. While the participants were playing lotto, they were calling out the number that they needed in order to win, and got louder once they knew prizes were involved. The participants smiled when they captured their opponent's piece, or won the game in checkers. The team made completing the jigsaw puzzles a competition by offering a prize to the group that finished first. Each participant showed more evidence of enjoyment once they had won the game, completed their puzzle, or achieved something that their opponent did not, such as capturing a piece or having a number in lotto.

Based on these findings, games that are familiar to the participants and include competition should be implemented into future programs. However, each game has a different level of cognitive difficulty. To continue to support the goals of the program, the games that have the most potential for cognitive development should be implemented first. Games should be implemented in the following order: puzzles, checkers, dominoes, zelena, and lotto.

Unfamiliar Games with Complicated Rules Were Unsuccessful in the Program

The participants were easily frustrated with games that were new to them and took a lot of time to explain. While playing concentration, the participants made the game harder for them-

selves by not placing the card they picked up back into the same place; this instruction must have been lost in translation. Two of the participants were frustrated with how much they were struggling and five participants gave up entirely. The results of the Enjoyment and Familiarity Survey can be seen in Figure 14. This was the only survey that received a negative response. Games that would not be recommended would be ones that are unfamiliar to the participants and have complicated rules. The complication of learning the game caused the participants to give up and become disengaged.

During week six, the participants were asked to play Tag Saruh, which was the highest scoring game. However, the participants were unenthusiastic about the game and did not want to play it. In addition, the participants were given the option to play backgammon or checkers. Everyone chose checkers, because backgammon is traditionally played by only men, and the participants of the program were mostly women. At least one backup game should be prepared for each session. It is more important to keep the participants engaged than to stick to a particular game plan.

Games Should be Modified To Fit the Capabilities of the Participants

In order for some games to be implemented in the program, they must be adapted to fit the needs of the participants. Many Armenian childhood games are very physical, yet the participants have limited physical mobility. For example,

■ Strongly Disagree ■ Disagree ■ Neither Disagree Nor Agree ■ Agree ■ Strongly Agree

Checkers

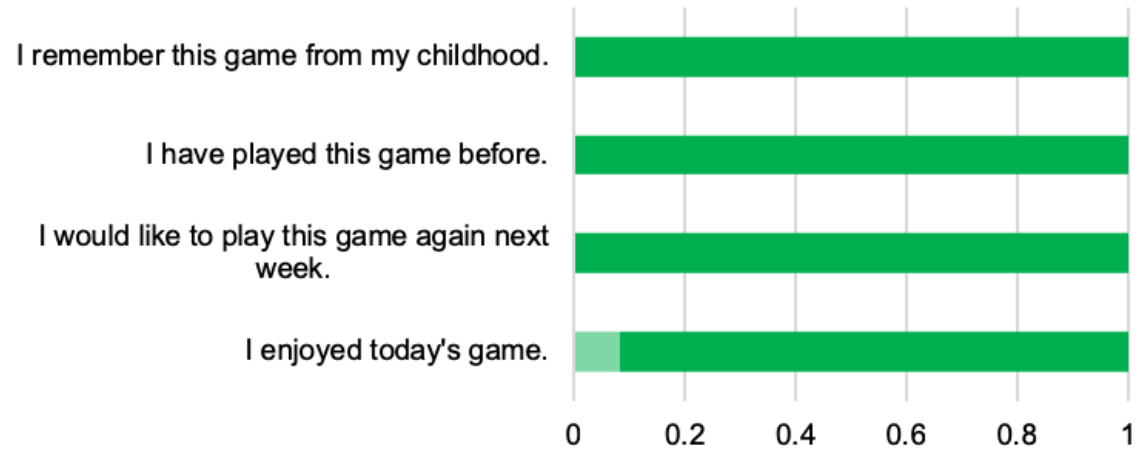


Figure 13: Checkers Survey Results

Concentration

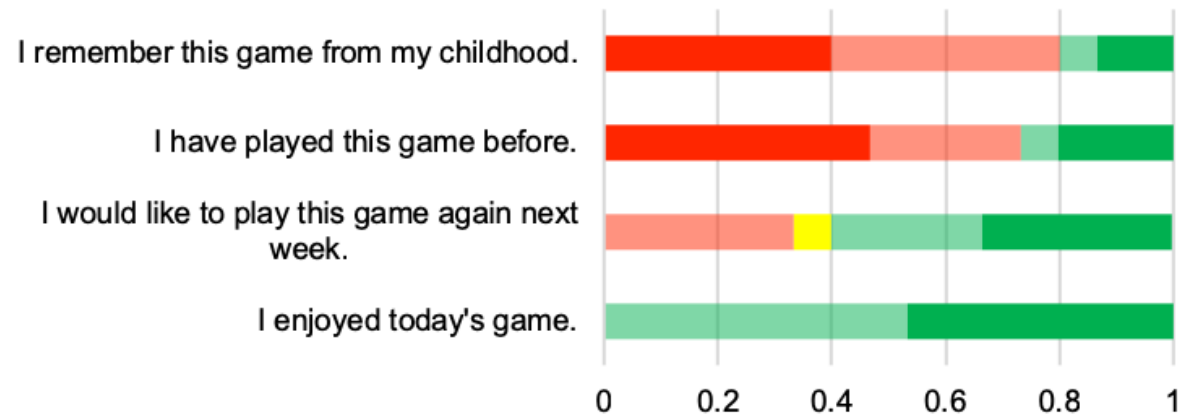


Figure 14: Concentration's Survey Results

halamola (a variant of hide and seek) was adapted to a hidden figures worksheet, which was created especially for the participants. The overall image was of a notable Armenian monastery, and the hidden figures had a varying range of difficulty. This was to ensure that every participant could find at least a few of the hidden figures. In addition, a traditionally more physical game, such as zelena, was adapted into a less physical version. The participants sat in a circle instead of standing, and they had to clap and place their hand on their head instead of squatting when the singing stopped. Adaptations such as these should continue in future Memory Clubs to allow a larger number of games to be considered for implementation that are both familiar to the participants and competitive.

Short Games Should be Included as Backup Games

Broken telephone was a familiar game to the participants, however the rounds were too short to keep the participants engaged for the duration of the game session. Halamola (hide and seek) was altered to be a hidden figures worksheet. The participants were very focused on the worksheet. The team also made it a competition where whoever finished the worksheet first got a prize.

Both of these games have some of the traits that qualify a game to stay in the Memory Club program, however, both are too short to play as the main game. The hidden figures worksheet took the participants anywhere from five to ten minutes. The participants had played two rounds

of broken telephone within five minutes. Therefore, the time filter should consider gameplay durations which are either too short or too long. These games were still fun for the participants and could be better used as one of several games in one session. It is important to prepare a backup for each session, in case the original game was not as successful as expected.

The Most Successful Arts and Crafts Projects Provide Structure, but allow Room for Creativity

The Memory Club should continue to implement arts and crafts projects that allow the participants to have the opportunity for creativity yet still have some guidance. Projects such as painting rug patterns, creating paper collages from cutouts, and making clay ornaments all utilized a template. When the participants had a baseline as well as the freedom to design what they wanted, they were more engaged. The participants painted the rug designs in their own way; some participants painted the design with traditional colors and only in the lines, while others went completely abstract. The participants were engaged when decorating Easter eggs made out of a slab of clay using textured rollers and stamps, and then cutting out the egg shape using a template provided. All these projects gave the participants a guide to get started and were able to still have the choice to design their artwork within that template.

While painting the still life, the participants started with a blank canvas. Without a tem-



Figure 15: Modified Halamola



Figure 16: Successful Arts and Crafts

plate, some of the participants needed assistance getting started. Drawing one's self portrait was too technical for the participants. The instructor wanted the participants to follow specific steps and came around and erased some of the participant's work if their ratios were off. This was the shortest session of arts and crafts in the Memory Club, as many of the participants did not finish their self-portraits. When the participants were

asked if they wanted to take their work home, a few of them said no because they didn't like what they had created.

Projects that had an outline or utilized a template, and still allowed the participants to create what they wanted, were the most successful. However, activities that provided no guidance whatsoever or that are too technically difficult, such as the self-portrait, are not enjoyable for the participants, and do not help build their confidence or artistic creativity.

Social Interactions Should be Considered when Scheduling the Games

The game that originally ranked first on the list, broken telephone, was deemed to have the most potential for benefits because it encouraged social interaction, took into consideration the participants' impairments, and was enjoyable and familiar to the participants. Each game was different, therefore other factors included the participants' comfort level with each other, and the number of players (especially if the game was played on a team). For example, broken telephone required participants to get close to each other and whisper in each other's ears. This game should not be implemented at the very beginning of the program, but towards the middle or end of the program when the participants have developed a stronger relationship with each other. Additionally, games that were played on a team, such as dominoes, should be played when there are enough participants present to make an equal

number of participants per team. Facilitators should fill in spots where needed, however there should be equal distribution of facilitators among the participants. This is important because it encourages social interactions between the participants, not between the participants and the facilitator.

Discussion Time and a Tea Break Allow the Participants to Socialize and Build Community

A discussion section was added prior to the beginning of the games to allow the participants to get to know each other better. The discussion was also used to provide feedback for planning future sessions. The questions that should be asked towards the beginning should help the facilitators learn how to structure the remainder of the program. Later in the program, questions should be tailored to check in on the participants to help the facilitators make any adjustments to the program.

Another recommendation about the program structure is to include a tea break. The participants of the program got tired over the course of each session, so a break was implemented between the game and the arts and crafts by the employees at Orran. The snack break was important for the participants, because it allowed them to regain energy before starting something new and extended their participation in each activity.

Instituting A Volunteer Program Would Provide Needed Support for Future Memory Clubs

One of the most important aspects of the Memory Club was social interaction, and the participants benefited from interacting with the team every week. The team played games with the participants, taught them English words, and learned their names. A volunteer program would allow participants of a future program to have a similar experience, as well as reduce the required number of staff at the hosting facility. Local high schools and/or universities would be the best sources of volunteers for the program.

Providing Games Outside of Memory Club Sessions Would Increase Opportunities for Social Interaction

The participants of the pilot program have repeatedly stated that they look forward to the Memory Club sessions all week. To increase social opportunities, the participants could stay at Orran after lunch and replay the games that were played during the Memory Club, but without the other elements such as discussion and crafts provided by the formal program. Informal social and game activities would potentially decrease the participants' feelings of isolation and continue to provide some

of the same benefits as the Memory Club. The games would have to be provided by the hosting facility.

Observational Cues Should Be Used to Assess the Success of New Games

After a new game has been passed through the filters and scaled items, it is ready to be implemented into the Memory Club program. If those conducting the research wanted to determine the success of a new game, the team recommends to look for the observational cues of enjoyment and displeasure that were used in the observation protocol. These observational cues include smiling, laughing, not participating, not making eye contact, giving up, looking confused, and asking questions. These cues can help the facilitator identify key benefits or drawbacks of the game. Along with the observational cues, general observations and anecdotal records should be kept. The anecdotes will allow the facilitator to understand the situation in which the cues are generated, and make proper recommendations for the future.

The Team Failed to Predict the Impact Our Interaction Would Have on the Participants

The staff at Orran told the participants of the program that we were coming several weeks prior to the start of the program, after which they eagerly awaited our arrival. Over the course of the

program, the team actively engaged with the participants. The results of the Enjoyment and Familiarity Survey reflected that everyone was enjoying the game every session, even if the observations said otherwise. Figure 17 shows the increasingly positive results from the survey. There are many reasons to explain the trend shown in Figure 17 including survey fatigue, the participants enjoying the games because of the team's involvement, answering the surveys to try to please us, or because we were doing an increasingly better job at implementing games. We suspected that our involvement and the participants trying to please

us were the main reasons for this trend, because the participants were excited to meet us before the program started. Therefore, the survey results should not be used to make recommendations alone about game selection, but should be supplemented with observations.

The data presented in this report is biased from interacting with the participants. Nevertheless, the team decided to continue to interact with the participants due to the positive benefits it had for the participants and the overall success of the program.

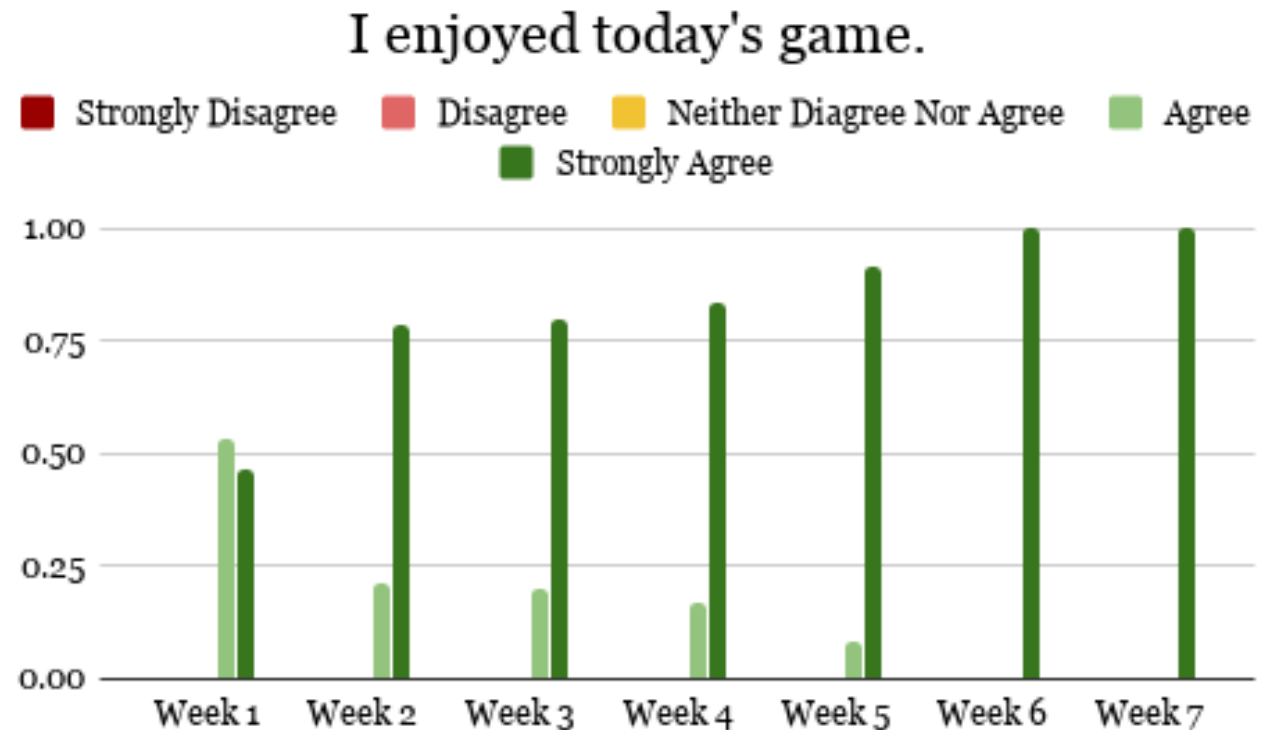


Figure 17: Enjoyment Question Results

Conducting Proper Testing Includes Standardizing the Environment

There are many factors that could have caused inconsistency in the MoCA testing, including the participant's lifestyle, how they were feeling before taking the test, and the administration of the test. There are many aspects of a person's lifestyle that will affect their cognitive function. For example, smoking nicotine, drinking alcohol, living alone, not eating properly, not getting enough sleep, not taking prescribed medicine, and other medical conditions may decrease cognitive functioning. In addition, the participant's activities immediately before the test is administered could make a significant difference. For example, people are more tired after eating lunch. Similarly, if the participant had an irregular morning, such as missing the bus or not eating breakfast, that could change their attitude and ability to focus on the test. The test administrators had no additional information about the participant's condition or if it had changed between tests. In order to better understand changes in cognitive function in future research studies, the team recommends that the researchers complete a lifestyle screening of the participants before and after the study.

The MoCA should be administered by someone who is trained to do so. The pre and post-tests should be administered and scored by the same person. The test that was given for the pilot program was verbally translated from English to Armenian by the administrator. Important

aspects of the test could have been lost in translation. In future studies, the test should be administered and scored in the same language to eliminate any chances of miscommunication. Additionally, the number of participants in the pilot program was too small to make any statistically significant conclusions. Therefore, the number of participants in a future research study should be larger.

Constructing the Ideal Research Study Involves Eliminating All Confounding Elements

This research study originally sought to determine the effects of playing childhood games on the cognitive function and anxiety levels of the Memory Club participants. However, there were many elements that made answering that question nearly impossible. Those elements included social interaction with the team, the discussion, the arts and crafts, and the food provided before and during the session. The MoCA and GAS-10 tests were administered before and after the entire program, there was no way to determine which portion of the program had specific benefits or drawbacks. The program had to be evaluated as a whole based upon the test results.

If another party were to conduct a research study to answer the original research question of whether or not the games have a positive effect on cognitive function and anxiety levels of the participants, then all other parts of the program must be eliminated. Everything in the current Memory Club format has some effect on the participants'

cognitive functioning. In an ideal research study, only the games would be contributing to the cognitive development of the participants. To eliminate the potential for bias as much as possible, the participants of the program would never interact with the observers, only within themselves and with the staff at the location. The researchers should record the program, or use a one way mirrored room, instead of making observations in the room while the program is being held. If the Enjoyment and Familiarity Survey is continued, it should be presented as a way to improve on the program for future sessions, not as a tool for a research study.

While it's important to research and understand the benefits of childhood games alone, the most important aspect of the Memory Club is the impact and improvement on the participant's cognitive development and anxiety levels. Future research studies should attempt to isolate the benefits of childhood games, however, it should not be done at the cost of the participants' growth. The impact made on the participants of the pilot Memory Club program is far more important than the potential for unbiased research.

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