Hands-on versus demonstration teaching methods: the effect on memory in older adults

Steven J. Bird
Medical College of Ohio

Follow this and additional works at: http://utdr.utoledo.edu/graduate-projects
Graduate School

FINAL APPROVAL OF SCHOLARLY PROJECT
For the Degree of
Master of Occupational Therapy

Title of Scholarly Project  "Hands-on Versus Demonstration Teaching Methods: The Effect on Memory in Older Adults"

Submitted by
Steve Bird
(Name)

In partial fulfillment of the requirements for the degree Master of Occupational Therapy

APPROVED

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara Kopp Miller, Ph.D.</td>
<td>Barbara Kopp Miller</td>
<td>12/16/04</td>
</tr>
<tr>
<td>Major Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Julie J. Thomas, Ph.D., OTR/L, FAOTA</td>
<td>Julie J. Thomas</td>
<td>12/16/04</td>
</tr>
<tr>
<td>Department Chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christopher E. Bork, Ph.D.</td>
<td>Christopher E. Bork</td>
<td>12/16/04</td>
</tr>
<tr>
<td>Dean, School of Allied Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keith K. Schlender, Ph.D.</td>
<td>Keith K. Schlender</td>
<td>12/20/04</td>
</tr>
<tr>
<td>Dean, Graduate School</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attachment: Abstract

Final Approval of SP MOT
Hands-on Versus Demonstration Teaching Methods:
The Effect on Memory in Older Adults

Steven J. Bird
Medical College of Ohio
Abstract

Objective - The purpose of the current study was to compare two different teaching methods (hands-on vs. demonstration) and their effect on immediate, short-term, and long-term memory recall in older adults. It was hypothesized that there would be a difference between the hands-on teaching method and the demonstration teaching method in the older adults’ immediate, short-term, and long-term memory recall.

Methods - Forty older adults participated in this study. The participants were randomly assigned to one of two conditions (hands-on or demonstration). Participants in the hands-on group were shown and performed each recipe step of a strawberry ice cream occupation. The participants in the demonstration group were only shown the ten recipe steps. Immediately after the last step of the recipe was complete, all participants were asked to repeat the ten steps. The same request was required fifteen minutes and twenty-four to forty-eight hours after the completion of the ice cream making occupation. All responses were recorded and scored following a strict protocol.

Results – The results of the MANCOVA indicated that there were no statistically significant differences between the two teaching methods (hands-on vs. demonstration) in terms of immediate, short-term, or long-term memory recall scores.

Conclusion – The results of the study did not support the hypotheses that there would be differences between the older adults who participated in the hands-on group versus the demonstration group in terms of immediate, short-term, and long-term memory scores. It is important to continue this line of research to determine the true effects of specific teaching methods with older adults.
Hands-on Versus Demonstration Teaching Methods:

The Effect on Memory in Older Adults

John Dewey, a philosopher on education, believed that active occupations are the way to promote learning (Dewey, 1916). Dewey advocated that the person should be an active participant when trying to learn. In fact, the definition of teaching, according to Mish (1994) is “to show how, (ex. A child to swim).”

Occupational therapists teach their patients ways to complete certain tasks, whether it is how to perform a strengthening routine or a simpler task of donning a sock with a sock aid. In doing this, the occupational therapist must decide which teaching method is most effective in terms of learning and retention for each patient.

The purpose of this study was to examine two different teaching methods and determine the effects of the teaching methods on memory recall in a group of older adults. Prior to reviewing the current study, two different types of teaching methods will be discussed. Three different types of memory followed by the effects of aging on memory also will be addressed. Past research on teaching methods and memory will be reviewed followed by a description of the current study.

*Teaching Methods*

Although there are many types of teaching methods, two are particularly important to this study. One type of teaching method often used by occupational therapists is the hands-on method. Hands-on learning is learning by doing. People are actively involved in manipulating objects to gain knowledge and understanding. For example, when teaching someone how to use a sock aid, the therapist watches as the patient tries to figure out the task. The therapist is there to guide the patient and answer any questions the patient may have. The therapist may also
demonstrate to the patient how to use a sock aid and then let him or her try it. It involves the person in a total learning experience, which enhances his or her ability to think critically.

Another type of teaching method is verbal demonstration. With this teaching method, people are shown materials to gain understanding and knowledge in a certain area. People utilize several senses when engaged in this process. In this method, though, patients are not actively participating in the occupation. They learn by watching others. Using the same example with the sock aid, the therapist would show the patient the exact process on how to use the assistive device. The therapist answers any questions from the patient, but the patient does not practice with the sock aid during the educational session.

Occupational therapists often use different teaching methods in treatment sessions. The occupational therapist must complete a treatment plan that correlates with his or her patient’s learning style. If a certain teaching method does not produce desired results, then an alternative teaching method may be necessary.

*Memory and Recall*

According to Connor (2001), memory is the “retention of something over an interval extending beyond its physical presence. Memory is demonstrated through repetition of the remembered action or object’s name, or through evidence of the action’s or objects’ influence.” There are three components to memory: immediate memory (or sensory memory), short-term memory along with working memory, and long-term memory.

Immediate memory is the process where new, incoming information is first registered. This may include immediate sensory stimuli such as a song heard on the radio or the sensation of someone shaking our hand. We experience these stimuli for only a small fraction of a second to
process the information. Immediate memory takes in very large amounts of information very rapidly (Cavanaugh & Blanchard-Fields, 2002).

Short-term memory is the process of holding information until it can be committed to long-term memory (Connor, 2001). This material may be lost within seconds if the material is unrehearsed. Short-term memory includes both primary memory and working memory. Primary memory is based on the more traditional notion of short-term memory as a unitary system involving the temporary storage of information. Its capacity is reflected in the amount of information that can be held in conscious awareness. Miller (1956) concluded that most individuals can hold seven plus or minus two bits of information for short periods. Working memory, like primary memory, is presumed to have a limited capacity. However, working memory is distinguished from primary memory by its simultaneous involvement in storing and processing information (Andiel & Liu, 1995). For example, when a person receives a bill at a restaurant, he or she needs to calculate a certain percentage for the tip. People use their working memory when they have to remember the bill total while figuring out the tip.

Long-term memory is the ability to remember extensive amounts of information from a few seconds to a few hours to decades. When people think about memory, they think about having to remember something over time (Cavanaugh, 2002). This can include everyday tasks such as remembering to call your friend or performing on an exam.

Recall involves remembering information without hints or clues. Free recall requires the individual to initiate the formation of the retrieval cues that may facilitate access to the desired information (Wingfield & Kahana, 2002). People must use their memory to recall any kind of information. To this end, it is important for occupational therapists to help their patients remember certain information so it will be easier to recall later.
Memory and Recall Changes in Older Adults

Experimental data on memory demonstrate only slight changes in the learning processes before the age of 65, after which there is a noticeable decline. There is consistent evidence that older adults require more time and effort than younger people to learn an equivalent amount of new information (Levy, 1996).

Structural information-processing theorists have found age-related decrements in the sensory memory store although age differences in short-term memory are minimal (Craik and Jennings, 1992). As a result, we can expect that older adults will be able to attend to, perceive, and retain information with the normal span of seven (plus or minus two) items with little difficulty (Levy, 1996).

It is at the level of long-term memory that significant age-related deficits have been documented. Beginning around age fifty, older adults appear to have more difficulty with retrieval of information from long-term memory. Although they perform almost as well as their younger counterparts on recognition tests, older adults do not fare well when using recall to retrieve information (Levy, 1996). When tested across a variety of tasks, the general rule of aging is that tasks that the young find difficult, or require a longer time to perform, are especially difficult or take especially longer for older adults (Wingfield & Kahana, 2002). There are several studies that have been conducted on different types of teaching methods and their effects on memory and it is to this topic that we now turn.

Previous Research on Different Teaching Methods

Warner (1989) compared the effects of hands-on activity combined with a demonstration activity versus a demonstration only activity in terms of the level of memory retention in older females. Twenty-nine females with moderate cognitive deficits participated in the study. The
Hands-on Versus Demonstration

Participants were assigned to either a hands-on group or a demonstration only group. In the hands-on group, the participants received one hour of demonstration and hands-on involvement with ice cream making. In the demonstration only group, they received only demonstration of the ice cream making. For both groups, memory retention was measured using a task-related quiz developed by the researcher. The author reported that the women who engaged in the hands-on purposeful occupation had a higher level of memory retention than women who engaged in the demonstration only occupation. This was one of the first studies that provided evidence that a hands-on purposeful occupation was more effective than demonstration in terms of short-term memory retention in older women.

Eakman and Nelson (2001) compared the effects of hands-on occupation versus verbal occupation in terms of free recall performance adults with brain injury. Thirty males with closed head injuries participated in the study. All participants received preliminary verbal instruction for a food preparation occupation. Each participant was assigned to one of two groups, a verbal occupation group or a hands-on occupation group. The individuals in the verbal occupation group only received the verbal information while individuals in the hands-on occupation group prepared the food item. Participants were then asked to recall the occupation’s steps presented to them in the correct order. The author reported that participants who engaged in the hands-on occupation recalled significantly more task step imperatives in their proper order than participants in the verbal occupation group. This study provided evidence that a hands-on condition was an effective method of teaching for males with closed head injuries.

Buddelmeyer (1995) also researched the effects of hands-on versus verbal occupation on memory. Specifically, she tested the effect on free recall in children with learning disabilities. The participants included sixty children with a learning disability between the ages of eight and
The participants were divided into two groups, either a hands-on group or a verbal only group. In the hands-on condition the children made play-doh. In the verbal condition, the children were presented the steps on how to make play-doh, but did not participate in making it. In each group, after the final step, the children were asked to recall as many steps as possible. The researcher concluded that children in the hands-on condition were able to recall more steps than the children in the verbal condition. This study provided evidence that a hands-on teaching method is effective in terms of recall for children with learning disabilities.

Hartman, Kopp Miller, and Nelson (2000) continued this line of research. Specifically, they tested the effects of hands-on occupation versus demonstration on children’s recall memory. Seventy-three school-aged children were included in this study. The children were assigned to one of two groups. The hands-on group participated in making a model of a volcano while the demonstration group observed the making of a model volcano. Following the task completion, children were asked to recall as many steps as possible in the proper order. The author reported that there was a significant difference between conditions in terms of free recall scores, with children in the hands-on condition having a greater recall score. Once again, this study provided evidence that a hands-on condition is effective in terms of recall in children.

Messina (1999) compared a hands-on teaching method versus a demonstration teaching method on immediate and final recall in forty-eight adults with mental disorders living in the community. The participants were either assigned to a demonstration condition or a hands-on condition. In the demonstration condition, the adults were shown steps involved with making no-bake cookies. In the hands-on condition, the adults were shown and asked to participate in making no-bake cookies. Following the last step of making the cookies and after fifteen minutes, adults in both conditions were asked to recall the steps in the correct order. The author
reported there was a significant difference between individuals in the two conditions, favoring the hands-on teaching method, in terms of short-term recall, but not in terms of immediate recall. This was the first study to look at recall after fifteen minutes. Prior studies assessed immediate memory only. Therefore, this study was different from past studies in the fact that there was no significant difference between individuals in the two conditions for immediate recall but there was for short-term recall.

Hearns (2000) expanded the memory variables that had been used thus far and tested the effects of hands-on demonstration teaching methods versus verbal demonstration teaching methods on memory in college students. She tested immediate, short-term, and long-term recall in college students. Sixty college students participated in the study. Each participant was assigned to either a hands-on group or a demonstration group. In the hands-on group, the students were shown and asked to actively participate in making no-bake cookies. The demonstration group was only shown how to make the no-bake cookies. After the last step was completed, fifteen minutes later, and twenty-four hours later, the participants were asked to repeat the steps of the occupation. The author reported there was no significant difference between the two groups in terms of immediate or short-term recall, but there was for long-term recall, in favor of the hands-on teaching method. Unlike Messina (1999), Hearns was unable to find a significant difference at short-term recall, but she did find a difference in long term recall.

Continuing this research, Kluczynski (2002) compared hands-on versus demonstration teaching methods on immediate, short-term, and long-term recall in older adults. Fifty older adults participated in this study. They were assigned to either a hands-on group or a demonstration group. In the hands-on group, the participants were shown and performed the steps in making ice cream. In the demonstration group, participants were only shown how to
make ice cream. Immediately after the last step of the recipe, fifteen minutes after the last step, and 24-48 hours after the last step each participant was asked to verbally recall, in order, the exact wording of a ten step recipe to make ice cream. Unlike Messina (1999) and Hearns (2000), the author reported that there were no statistically significant differences between the two teaching methods in terms of immediate recall, short-term recall, or long term recall.

Overall, a hands-on teaching approach was the most effective teaching method in terms of memory retention in various populations. Adults with brain injuries, children with learning disabilities, healthy children, and elderly females with cognitive disorders, all remembered more in terms immediate recall when they were in a hands-on teaching group. Adults with mental disorders and college students both remembered more in terms of long-term recall but not immediate recall when placed in a hands-on teaching group. Elderly females with cognitive deficits did remember more in terms of short-term memory when placed in a hands-on teaching group. Finally, in healthy, older adults, a hands-on teaching approach did not seem to make a difference in terms of amount remembered in immediate memory, short-term memory, or long-term memory compared to older adults in the demonstration only teaching approach.

Many previous studies discovered differences in teaching methods with various populations. Only one study examined the role of teaching methods on the memory of healthy older adults. Kluczynski (2002) did not find any differences between a hands-on versus demonstration teaching method on immediate, short-term, and long-term recall in older adults. Therefore, it is important that this line of research be replicated to determine which teaching method was most effective.
Current Study

This study was intended to be a modified replication of Kluczynski’s (2002) in an attempt to find differences on memory and recall in older adults. It is important to continue research with older adults because there is a deficit of research with this population on the effects of teaching methods and memory recall. As the number of occupational therapists increase to 40,000, more of these therapists are reporting geriatrics as their primary practice focus. Approximately 30% of occupational therapists reported that they work with geriatric patients (Levy, 1996).

The purpose of this study was to compare two different teaching methods (hands-on vs. demonstration) and their effect on immediate, short-term, and long-term memory recall in older adults. Previous studies have concluded that hands-on teaching methods contributed to greater recall compared to demonstration teaching methods [Buddelmeyer (1995), Hartman (1997), Messina (1999), Eakman and Nelson (2001), and Warner (1989).] Even so, there are dissimilarities in the effect of teaching methods on short-term and long-term memory. Therefore, non-directional hypotheses were proposed. It was hypothesized that there would be a difference between the hands-on teaching method and the demonstration teaching method in terms of immediate recall with older adults. It also was hypothesized that there would be a difference between the hands-on teaching method and a demonstration teaching method in terms of short-term recall in older adults. It was hypothesized that there would be a difference between the hands-on teaching method and the demonstration teaching method in terms of long-term recall in older adults. Finally, it was hypothesized that there would be a difference between the hands-on teaching method and the demonstration teaching method in terms of the order of recipe steps remembered.
Methods

Participants

Forty older adults living in independent living facilities and senior centers were recruited for the study. For participation, the older adult needed to score above a 20 on the Folstein Mini-Mental State Examination (MMSE) (Folstein, Folstein, and McHugh, 1975). If the person did not score above a 20, then he or she was not allowed to participate. In addition, the participant had to have the required range of motion to complete each recipe step, be able to see and read each recipe step, and have no previous experience in completing a similar ice cream making occupation. If the participant did not meet each requirement, he or she was thanked and excused from the research study.

Materials and Instruments

The MMSE is a cognitive function test that consists of two parts. The first part requires verbal responses to questions that address orientation, memory, and attention. The second part contains non-orientation items, which assesses the ability to name objects, follow written and verbal commands, compute a basic math problem, and retrieve certain items from memory. There are a total of eleven questions with a maximum score of thirty. Scores between 21 and 30 indicate the person is functioning within normal limits. (Folstein, Folstein, and McHugh, 1975).

The materials that were used for the hands-on condition were: two paper towels, two colanders, two blenders, two medium sized mixing bowls, two small bowls (for collection of excess ingredients), a small pitcher (for water), six tablespoon measuring spoons (1 tbsp), two liquid measuring cups (1/2c), two spoons, an automatic ice cream maker, a garbage bag for disposal, ice cream scoop, and a timer. Two bowls and two spoons were provided for consumption of the ice cream once it was completed. For the demonstration condition, only half
the number of materials were used in addition to the rest of the supplies. Ingredients that were used by both conditions were strawberries (pre-rinsed), water, sugar, lemon juice, and heavy cream. Four by six white, index cards were used to write each step of the recipe, and shown to the participants in each condition while they were making the ice cream. A tape recorder and standard micro-cassette tape for recording participants’ responses were used.

*Procedure*

All participants were required to sign an informed consent form prior to participation in the study. Each participant was randomly assigned to either the hands-on condition or the demonstration condition. The principle investigator administered both conditions of the independent variable, testing each participant individually. In both conditions, the principle investigator sat directly across from the participant while explaining the steps of the recipe. Also, each participant was timed to determine how long it took to complete the ice cream making occupation. The occupation that was used for each condition was making strawberry ice cream.

In the demonstration condition, the investigator read aloud each step of the recipe on the index card, and then asked the subject to repeat the step back to the investigator. The investigator then demonstrated the step for the participant to observe. For the hands-on condition, the same procedure was used except now the participant as well as the investigator both performed each step of the recipe. For both conditions, all materials not required for the current step were placed out of the participant’s sight.

The participants in the hands-on condition were read the following instructions:

“Today, I am going to show you the steps required to make strawberry ice cream. After I read a step of the recipe, I want you to repeat the step back to me so I know you have understood what I have said. I want you to remember each step of the recipe exactly as it appears on the index card. Then, I will demonstrate each step to you, and ask you to also perform the step. After we have gone over all of the steps, I will ask you a few questions. Then I will ask you to tell me the steps of the recipe in the correct order.”
Once the testing has begun, I will not be able to answer any questions about making the ice cream until you return tomorrow. Do you have any questions?”

If a participant had any questions regarding the instructions, the instructions were repeated to the participant until he/she acknowledged understanding of the instructions. The investigator then said, “Since you are sure you understand the instructions, let’s make some ice cream.”

For the hands-on condition, each participant was shown and read the first step of the recipe, “Prepare the strawberries by washing them” and then they were asked to repeat the step. The investigator had placed the index card in front of the participant and brought out two paper towels, two colanders, and sixteen strawberries (eight each) to the table. The participant walked to the sink and washed the strawberries. Then the participant brought the strawberries to the table and placed them on the paper towel for drying. The investigator then placed an index card containing the step of the recipe in front of the participant. The investigator demonstrated the step and then asked the participant to do the same.

The second step of the recipe, “Place the strawberries in the blender” was read aloud by the investigator and then repeated by the participant. The investigator brought two blenders to the middle of the table and placed an index card containing the step of the recipe in front of the participant. The investigator demonstrated the step and then asked the participant to do the same.

Step three, “Measure two tablespoons water into the blender and mix for about ten seconds” was read by the investigator and repeated by the participant. Two tablespoons, a small pitcher of water, and two small bowls for excess ingredients to fall, were brought to the table. The investigator then placed an index card containing the step of the recipe in front of the
participant. The investigator demonstrated the step and then asked the participant to do the same.

The fourth step of the recipe was, “Pour the strawberry mixture into a mixing bowl.” The investigator read aloud this step and asked the participant to repeat it. The investigator then brought out two medium sized mixing bowls and an index card with the recipe step on the table. The investigator demonstrated the step and then asked the participant to do the same.

For the fifth step, the investigator read, “Measure three tablespoons of sugar into the bowl,” and then was repeated by the participant. The investigator brought out two tablespoons, a container of sugar, and an index card with the recipe step to the table. The investigator demonstrated the step and then asked the participant to do the same.

In the sixth step, the instructions were, “Measure one tablespoon of lemon juice into the bowl.” The investigator read aloud the step and then asked the participant to repeat that step. Two tablespoons as well as a jar of lemon juice was placed in front of the participant. The investigator then placed an index card containing the step of the recipe in front of the participant. The investigator demonstrated the step and then asked the participant to do the same.

The seventh step of the recipe, “Measure ½ c. of heavy cream into the bowl,” was read aloud by the investigator, and then repeated by the participant. Two ½ c measuring cups were placed in front of the participant as well a carton of heavy cream. The investigator then placed an index card containing the step of the recipe in front of the participant. The investigator demonstrated the step and then asked the participant to do the same.

Step eight, “Mix the ingredients with a spoon for one minute,” was read by the investigator and repeated by the participant. Two spoons were placed in front of the participant. The investigator then placed an index card containing the step of the recipe in front of the
participant. The investigator demonstrated the step and then asked the participant to do the same.

In step nine, the step was, “Pour the ingredients into the ice cream maker.” The investigator read aloud the step and asked the participant to repeat that step. The automatic ice cream maker was placed in front of the participant. The investigator then placed an index card containing the step of the recipe in front of the participant. The investigator demonstrated the step and then asked the participant to do the same. Both the investigator and the participant used the same ice cream maker for their ingredients.

Finally, for the last step, “Turn on the ice cream machine and set the timer for twenty minutes,” was read by the investigator and repeated by the participant. The investigator turned the ice cream machine on then off for a demonstration. The participant then turned the ice cream machine back on. The investigator set the timer for twenty minutes and then reset it back zero. The participant then set the timer for twenty minutes.

The participants in the demonstration condition were read the following instructions:

“Today, I am going to show you the steps required to make strawberry ice cream. After I read a step of the recipe, I want you to repeat the step back to me so I know you have understood what I have said. I want you to remember each step of the recipe exactly as it appears on the index card. Then, I will demonstrate each step to you. After we have gone over all of the steps, I will ask you a few questions. Then I will ask you to tell me the steps of the recipe in the correct order. Once the testing has begun, I will not be able to answer any questions about making the ice cream until you return tomorrow. Do you have any questions?”

If a participant had any questions regarding the instructions, the instructions were repeated to the participant until he/she acknowledged understanding of the instructions. The investigator then said, “Since you are sure you understand the instructions, let’s make some ice cream.”
In the demonstration condition, the participants followed the same procedure as the hands-on condition, except that the demonstration condition was not asked to perform the step. Instead, the participant watched the investigator complete each step of the recipe. Also, only one of each material was placed on the table for each step.

After all of the steps were completed in the recipe for both conditions, the investigator asked three distraction questions to reduce the odds of rehearsal of the recipe steps. The same three questions were asked to each participant. They were: “What is your favorite kind of ice cream? What kind of toppings do you put on your ice cream? Where do you usually go to get your ice cream?”

Next, for both conditions, the investigator said:

“Now, I’m going to ask you to try and remember as many steps of making strawberry ice cream as you can. Try to remember the exact wording of the step as it appeared on the white index card. Also, make sure you tell me the steps of the recipe in the correct order. I will be using a tape recorder to record your answers, so I can listen to them later. When you can’t remember any more of the steps or if you feel you are done, let me know and I will turn off the recorder. Do you have any questions? Remember, you cannot ask me any questions about making the ice cream after we begin. Are you ready to continue?

When the participant indicated that he/she had no further questions and was ready to continue, the investigator stated:

“No, you may begin telling me the steps to the strawberry ice cream recipe. Remember to try to use the same wording that was on the white index cards and tell me the steps in the correct order. You will have five minutes to complete this and I will not be facing you while the recorder is on. Are you ready? Begin.”

While the participant recalled the steps, the investigator turned his back to the participant so he/she was not be able to interpret any reactions of the investigator. Also, this was done so that the participant could feel comfortable while trying to recall the steps of the recipe.
Recording stopped when the participant indicated that he/she was unable to remember any more steps, or at the end of five minutes. If the participant was silent for ten seconds, the investigator asked the participant to just try and remember as much as he/she was able to remember. If ten more seconds passed with no response from the participant, the investigator asked him/her if he/she was finished. If the answer was yes, then the recording ended. If the answer was no, the investigator repeated the above prompt. Recording ended if another ten seconds passed without an answer.

Following the immediate recall phase, the investigator and the participant cleaned the dirty dishes left behind by the ice cream making occupation. After fifteen minutes had elapsed since the participant completed his/her immediate recall portion, the investigator ended the dishwashing occupation. The investigator also stated that they would enjoy the ice cream in a few minutes, but first the participant had to recall the steps of the strawberry ice cream recipe again. The investigator said:

“I would like to see how many steps of the strawberry ice cream recipe you can remember now that some time has elapsed. Try to use the same wording as it appeared on the white index card, and remember to repeat the steps in the correct order. I will be recording your answers again, and the same rules apply from before. Do you need me to repeat the instructions from before?”

If the participant needed the instructions to be repeated, the investigator read the same instructions as before and then asked the participant if he/she was ready to continue. If the participant was ready to begin, the tape recorder started. The same procedure used during the immediate recall portion was used for this short-term recall portion. After the short-term recall portion finished, the investigator turned off the ice cream maker, and served a bowl of ice cream to the participant if he/she wanted some.
After twenty-four hours, but no longer that forty-eight hours, had passed from the presentation of the recipe steps, the participant returned to finish the study. The investigator said:

“Thank you for coming back. We are almost done. I would like you to try and remember the recipe steps of making strawberry ice cream one more time. Try to use the same wording as it appeared on the white index card, and remember to repeat the steps in the correct order. I will be recording you answers again, and the same rules apply from yesterday. Do you need me to repeat the instructions again?”

If the participant needed the instructions to be repeated, the investigator read the same instructions as before and then asked if the participant if he/she was ready to continue. If the participant was ready to begin, the tape recorder started. The same procedure used during the immediate recall portion and short-term portion was used for this long-term recall portion.

Once the participant finished the long-term recall portion, he/she was thanked for participation in the research study and was asked if they had any final questions. If the participant had any questions, the investigator answered them at that time. The participant was thanked again and was excused.

*Scoring of data*

The participants’ answers were scored and recorded by the principle investigator. The answers were also scored separately by the co-investigator. The principle investigator and the co-investigator then scored the participants’ answers together. The responses were scored based on the number of syntactical units remembered in the proper order.

Points were awarded for the predetermined syntactical units for each step of the recipe (see Appendix A). The total amount of syntactical unit points possible was 29. In order for the participant to receive all points for the step, the participant had to state each syntactical unit of the step. For example, in the first step, “Prepare / the strawberries / by washing them” the
participant received three points if they remembered all three of those syntactical units. If the participant left out a syntactical unit, such as “Prepare,” the participant earned two points for that step. The investigators predetermined acceptable alternative substitutions for words before the scoring took place.

Points also were awarded to the participant if he/she remembered the steps of the recipe regardless of order. The participant, though, had to remember all of the syntactical units for a step in order for it to be counted. By doing this, the participants received credit for just remembering the steps, even if they were not in the correct order as specified on the white index cards.

Guidelines to receive points in the correct order of the recipe steps were as follows:

1) Step 1 had to be the first step of the recipe,
2) Steps 2-3 had to be after step 1 and before step 4-10 (regardless of their order),
3) Step 4 had to be right after step 3 and before 5-10,
4) Steps 5-7 had to be after step 4 and before step 8-10 (regardless of their order),
5) Step 8 had to be after steps 1-7 and before step 9-10,
6) Step 9 had to be after steps 1-8 and before step 10, and
7) Step 10 had to be the last step,

Immediate, short-term, and long-term recall scores were scored separately and then compiled into a final score that determined the participant’s total recall scores. Each participant could receive up to 29 points for recall scores, plus 10 additional points for the correct order of the recipe steps. Therefore, the most points possible were 39 for each memory component (immediate, short-term, and long-term).

Results
Data analyses were based on the results of the forty older adults that participated in the study. The forty older adults were randomly assigned to one of two groups (hands-on or demonstration) consisting of twenty participants each. The hands-on group was 95% female and 5% male. In addition, 85% of this group was Caucasian, while 10% were Hispanic and 5% Asian. The average MMSE score was a 26.8 ($SD = 2.12$, range 21-30). The average age of this group was 80.3 ($SD = 5.43$, range 73-89).

In the demonstration group, as in the hands-on group, the majority of the participants were Caucasian females. The demonstration group consisted of 65% females and 35% males. Also, 95% of this group was Caucasian, while the remaining 5% were African American. The average MMSE score was a 27.4 ($SD = 1.47$, range 24-30). The average age of this group was 77.2 ($SD = 6.69$, range 65-89).

Two participants from the demonstration group had missing data. One participant did not make her final appointment within the 48-hour time period. The other participant’s missing data was due to a technical error with the tape recorder.

The principle investigator and co-investigator scored the results once all data collection was completed. The principle investigator scored the results separately from the co-investigator. The principle investigator and the co-investigator then compared scores and once again re-scored the results a third time to ensure reliability.

Hypothesis Testing

Refer to table 1 for the means and standard deviation of each variable.

A 2 x 3 x 2 (group x total score x mini-mental score) multivariate of covariance (MANCOVA) was performed with the factor of mini-mental score being the covariate. A multivariate design was chosen because the factor of total score was performed by all
participants. Further, the total score factor was nested within the factor of group and mini-
mental score.

Although MANCOVA analysis resulted in the covariate mini-mental score being
significant \([F(3,33) = 3.192, p = .036]\), the factor of the group was not significant, \([F(3,33) = 1.127, p = .352]\). Likewise, the between subjects results were that the covariate mini-mental
score was significant \([F(1, 37) = 9.185, p = .005]\), however, the immediate, short-term and long-
term total scores within the factor of group were not \([F(1, 37) = 1.382, p = .248\) and \(F(1, 37) =
2.969, p = .094\), respectively].

Hence the mini-mental scores of the participants as a covariate were significant, that is,
the mini-mental scores in the one group were significantly different that the mini-mental scores
in the other group. However, even with this statistical error being accounted for with the
MANCOVA model, the effect of the factor of group was not powerful enough to reach a level of
statistical significance for either the short or long scores.

The MANCOVA revealed no significant differences for the factor of group, or for the
covariate mini-mental score \([F(3, 33) = .259, p = .854; F(3, 33) = 2.123, p = .116\), respectively].
Likewise, the between subject for the factor of order recall within the factor of group were not
significant for immediate, short-term, and long-term order recall \([F(3, 33) = .535, p = .469; F(3,
33) = .380, p = .541; F(3, 33) = .689, p = .412\), respectively].

Discussion

It was hypothesized that older adults in the hands-on group would have higher
immediate, short-term, long-term memory and order scores compared to participants in the
demonstration group. The results indicate that there were no differences in the teaching methods
(hands-on vs. demonstration) on an older adults’ immediate, short-term, and long-term memory
in terms of amount and order remembered. Therefore the results of this study did not support the hypotheses, contradicting results of similar studies [Warner (1989), Eakman (2001), Buddelmeyer (1995), Hartman, Kopp Miller, & Nelson (2000), Messina (1999), and Hearns (2000)].

This study was not the first to report non-significant differences between groups in this line of research. Although Messina (1999) found significant differences in final recall scores, she did not find significant differences between individuals in the hands-on group and individuals in the demonstration group in terms of recipe steps remembered for immediate recall (as soon as occupation ended). Similarly, Hearns (2000) reported significant differences in long-term recall scores, but reported no significant differences between individuals in the hands-on group and individuals in the verbal demonstration group in terms of recipe steps remembered for immediate and short-term recall (as soon as occupation ended and fifteen minutes later). Finally, Kluczynski (2002) reported no significant differences between individuals in the hands-on versus individuals in the demonstration group in terms of recipe steps remembered for immediate, short-term, and long-term recall.

This was the second study to address different types of teaching methods (hands-on vs. demonstration) on older adults’ immediate, short-term, and long-term memory. The results of this study suggest certain types of teaching methods (hands-on versus demonstration) did not produce differences in an older adult’s immediate, short-term, and long-term memory.

There is a noticeable decline in the learning process after the age of 65. Older adults require more time and effort than others to learn an equivalent amount of information (Levy, 1996). It is possible that the older adults in this study may have had difficulties in processing the new information so quickly regardless of the condition they were in. They may have found
the occupation too challenging and quick to remember the large quantities of new information. Therefore, each group displayed equal memory skills and did not have an advantage over the other.

Some participants, by observation, seemed overwhelmed to complete such a daunting task once the instructions were given. Many of these older adults may not have participated in such a rigorous memory test in this stage of their life. Several of the older adults also questioned why they had to memorize the ten recipe steps. They said they never had to memorize a recipe. They always had every step written out in front of them when cooking. Additionally, many older adults seemed preoccupied with getting every step correct that they lost focus as what they were actually doing. They did not look at the task as an ice cream making occupation, rather a memorization test. In this case, neither group, (hands-on or demonstration) had a clear advantage over the other.

Based on this study, the type of teaching method used by an occupational therapist does not seem to make a difference for a healthy older adult. Either teaching method (hands-on or demonstration) was equally effective on an older adults’ immediate, short-term, and long-term memory.

Because many occupational therapists work with older adults, it is crucial to determine if there is a teaching method that is more effective for older adults. The quicker a patient learns a new skill or task, the more time the patient can devote to other occupations. For example, if an occupational therapist teaches a person how to use a sock aid, but the patient forgets the following therapy session, then the therapist must devote some time teaching it over again. If the therapist is successful at teaching the patient a certain skill or task, the therapist can move on to new skills and tasks to teach the patient.
It is also important to take into account a patient’s memory when teaching him/her a new task. For example, some patients may have excellent immediate or short-term memory, but have poor long-term memory. The occupational therapist must design a treatment plan that gives attention to any memory deficits. It is important to incorporate memory strategies to compensate for this long-term memory loss. When working with older adults, occupational therapists must realize that the memory capabilities of the older adults may be different as compared to their younger patients.

**Limitations**

There were several limitations to this study. First, there is the possibility that a Type II error exists. A Type II error occurs when reporting a lack of statistical significance when a relationship actually occurs. Potential sources of Type II error include small sample size and high variance within groups. In this study, the sample size was small and individual scores within the conditions were highly dispersed.

Second, there were only forty older adults that participated in the study. The results may have been different if there were more participants recruited for the study.

Also, the scoring of responses appeared to be very restrictive for the order variable. The participants were given additional points if they remembered the steps in the correct order. They only received credit, though, if they remembered all of the syntactical units for that step. For example, the first step was, “prepare the strawberries by washing them.” Many participants, though, remembered the first step as, “wash the strawberries.” Therefore, they did not remember all syntactical units of that step, and were penalized. Since they did not remember the first step, the participants were not given credit for subsequent steps. If the scoring were not so strict, the immediate, short-term, and long-term order scores for many participants would have increased.
Another limitation was the environment in which the participants completed the occupation. Participants were recruited from six different performance sites. Therefore, certain factors in the environment could not be controlled for at each site. There were different distractions at different performance sites. For example, at one of the performance sites, a chorale group could be heard singing in the distance on certain days. This was a minor distraction to some of the participants and may have affected their concentration, leading to a decrease in overall scores.

Also, some of the performance sites were only open in the morning while others were open all day. Therefore, testing at different times of the day may have played a factor in the results. Some people seemed noticeably more tired if tested at the end of the day as compared to the morning.

Finally, the principle investigator and advisor conducted the experiment as well as scored all data. It would have been ideal to have a person who was unbiased and blind to the study score the results. The unbiased person would not be inclined to score each condition differently and have no concern with the overall results.

*Future Research*

Future research should include a higher number of participants recruited for the study. It would have been more beneficial to have more results and a different mix of people participating in the study. If there were more participants, the outcomes predicted by the hypotheses would be more accurate. There would be a higher confidence that a certain teaching method would (or would not) elicit a greater total recall score if there were a higher number of participants. Also, the larger and more diverse the participant population is, the more confident the results can be typified to the general population.
The scoring system should be changed for future research. It should not be so strict as to penalize participants that remembered a step but could not remember every syntactical unit. Also, it would be advantageous to also have the participant perform each step again once the occupation was completed. This method would be ideal because of its practicality and functional relevance. Participants would probably be more apt to remember certain steps of the recipe if they could re-make the ice cream themselves. For example, many people forgot to mention, “Measure ½ c. heavy cream into the bowl,” an essential ingredient for ice cream when trying to recall the step by memory. Many participants stated that they would have remembered that step if they were making the ice cream themselves as opposed to having the pressure to remember the steps by memory only.

Future research could also include only one performance site for this study. Although, it may be difficult to recruit from one site, it is ideal to control for extraneous variables that may play a part in completion of the occupation. This experiment should be completed at the same place for each participant to ensure equality.

Conclusion

The current study did not show a difference between hands-on versus demonstration teaching methods on immediate, short-term, and long-term memory in older adults. Although many studies have concluded that hands-on teaching methods are more effective than demonstration teaching methods in different populations (e.g., children, women, patients with TBI, etc.), it is important that more studies be conducted with older adults. It is crucial for occupational therapists to determine if there is a teaching method that is more effective for older adults that aids in memory recall.
References


Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 63, 81-87


Appendix A

Predetermined Syntactical Units for Ice Cream Recipe

1. Prepare/ strawberries/ by washing them. (3 points possible)
   Prepare = Get Ready, Arrange, Fix
   Strawberries = Berries, Fruit
   Washing = Cleaning, Rinsing, Wetting

2. Place/ strawberries/ into blender. (3 points possible)
   Place = Deposit, Put, Drop
   Strawberries = Berries
   Into = In, To, Inside
   Blender = Mixer, Chopper

3. Measure 2 Tablespoons/ water/ into the blender/ and blend for about 10 seconds.
   (4 points possible)
   Measure = Count, Scoop, Put, Add
   Into = In, To, Inside
   Blender= Mixer, Chopper
   Blend = Mix, Mix up, Beat, Stir, Combine

4. Pour/ Strawberry mixture/ into mixing bowl. (3 points possible)
   Pour = Add, Place, Put, Dump, Transfer, Empty
   Strawberry mixture = Berry mixture
   Into = In, To, Inside
   Mixing bowl = Container, Basin, Measuring Bowl, Bowl, Cup

5. Measure 3 Tablespoons/ sugar/ into mixing bowl. (3 points possible)
   Measure = Count, Scoop, Put, Add
   Sugar = Granulated Sugar
   Into= In, To, Inside
   Mixing Bowl = Container, Basin, Measuring Bowl, Bowl, Cup

6. Measure 1 Tablespoon/ lemon juice/ into mixing bowl. (3 points possible)
   Measure = Count, Scoop, Put, Add
   Lemon Juice = Lemon Extract, Lemon
   Into = In, To, Inside
   Mixing Bowl = Container, Basin, Measuring Bowl, Bowl, Cup

7. Measure ½ cup/ heavy cream/ into mixing bowl. (3 points possible)
   Measure = Count, Scoop, Put, Add
   Heavy Cream = Cream, Whipping Cream
   Into = In, To, Inside
   Mixing Bowl = Container, Basin, Measuring Bowl, Bowl, Cup
8. Mix ingredients/ with spoon/ for one minute. (3 points possible)
   Mix = Stir, Blend, Combine, Mix up, Beat
   Spoon = Metal spoon, Mixing Spoon,

9. Pour ingredients/ into ice cream maker (2 points possible)
   Pour = Add, Place, Put, Dump, Transfer, Empty
   Ice Cream Maker = Machine, Ice Cream Machine, Maker, Freezer, Motor

10. Turn the machine on/ and set the timer for 20 minutes. (2 points possible)
    Turn on = Start
    Machine = Ice Cream Maker, Ice Cream Machine, Maker, Freezer, Motor
    Set = Put, Move, Twist
    Timer = Clock, Alarm Clock,

Total Possible Points: 29
Table 1

*Scores and statistics of each condition*

<table>
<thead>
<tr>
<th>Memory components</th>
<th>Condition</th>
<th>Hands-on Mean (SD)</th>
<th>Demonstration Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Immediate score</td>
<td>14.40 (3.91)</td>
<td>13.25 (4.63)</td>
</tr>
<tr>
<td></td>
<td>Immediate order</td>
<td>.40 (.99)</td>
<td>.85 (1.49)</td>
</tr>
<tr>
<td></td>
<td><strong>Immediate total</strong></td>
<td><strong>14.80 (4.14)</strong></td>
<td><strong>14.10 (4.88)</strong></td>
</tr>
<tr>
<td></td>
<td>Short-term score</td>
<td>14.50 (3.57)</td>
<td>13.80 (5.16)</td>
</tr>
<tr>
<td></td>
<td>Short-term order</td>
<td>.30 (.92)</td>
<td>.65 (1.42)</td>
</tr>
<tr>
<td></td>
<td><strong>Short-term total</strong></td>
<td><strong>14.80 (3.79)</strong></td>
<td><strong>14.45 (5.35)</strong></td>
</tr>
<tr>
<td></td>
<td>Long-term score</td>
<td>16.22 (3.49)</td>
<td>14.15 (5.93)</td>
</tr>
<tr>
<td></td>
<td>Long-term order</td>
<td>.27 (.95)</td>
<td>.75 (1.68)</td>
</tr>
<tr>
<td></td>
<td><strong>Long-term total</strong></td>
<td><strong>16.47 (4.22)</strong></td>
<td><strong>14.90 (5.72)</strong></td>
</tr>
</tbody>
</table>