The effects of hands-on learning versus learning by demonstration on memory in community dwelling older adults

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The Effects of Hands-on Learning Versus Learning by Demonstration on Memory in Community Dwelling Older Adults

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May 2011

This scholarly project reflects individualized, original research conducted in partial fulfillment of the requirements for the Occupational Therapy Doctorate Program, The University of Toledo.
Abstract

**Objective.** This study compared the effect of two teaching methods, hands-on and demonstration, on immediate, short-term, and long-term recall in older adults without memory impairment living in the community.

**Method.** Twenty older adults participated in the study. The individuals were given the Folstein Mini Mental State (Folstein, Folstein, & McHugh, 1975) test to screen for memory impairment. Individuals had to obtain a score of 24 or higher out of a possible 30 in order to participate. Individuals were randomly assigned to one of two conditions by a computer generated program. In the demonstration condition, individuals were shown the steps involved in the occupation. In the hands-on condition, individuals were shown the steps involved in the occupation while also participating in the occupation. Recall was tested for both conditions immediately following the last step of the occupation, 15 minutes later, and at 24-48 hours.

**Results.** There were no statistically significant differences between the two teaching methods in both immediate ($Z = -1.74, p < .081$) and 15 minute ($Z = -1.82, p < .069$) recall. A significant difference was found between hands-on versus demonstration in 24-48 hour recall with participants in the hands-on group recalling more of the syntactical units in order than participants in the demonstration only condition ($Z = -2.36, p < .018$).

**Conclusion.** No significant differences were found for immediate and 15 minute recall for both conditions. A significant difference was found at 24-48 hours. The participants in the hands-on condition recalled more of the syntactical units in the correct order compared to participants in the demonstration only condition. The long-term effects of using the hands-on teaching method appeared to increase a person’s ability to recall information. Occupational therapy can apply this
information in the development of learning conditions for diverse populations, including community dwelling older adults.
The Effects of Hands-on Learning Versus Learning by Demonstration on Memory in Community Dwelling Older Adults

Occupational therapy is a health profession which exists to help people achieve independence, meaning, and satisfaction in all aspects of their lives. Occupational therapists help people accomplish their daily living tasks, adapt to permanent losses, learn new skills, and participate in their environment despite limitations or impairments in mental or physical functions through the teaching-learning process. The occupational therapist’s goal is to provide the client with skills for the job of living. The term “occupation” is derived from Dewey (1916), who believed that learning through active doing was more beneficial than simply learning. Learning is greatly enhanced when combined with a meaningful and purposeful hands-on occupation. The act of doing facilitates learning because the occupation is reinforced through technique, sensory stimulus, and recitation versus learning by recitation alone.

The purpose of this study was to examine the effects of hands-on learning versus demonstration learning on memory in community dwelling older adults. There is limited research on older adults and hands-on learning versus demonstration learning, especially in regards to memory. The essential theoretical background and recent research on hands-on versus demonstration will be reviewed and then a description of the current study will follow.

Teaching Method

There are three teaching methods available for occupational therapists. The first method is verbal instruction. Verbal instruction is passive learning. Cognitive and auditory functioning is required of the learner. A teacher lecturing students is an example of verbal instruction. This method is without active learner involvement; the individual is not physically interacting with their environment (Warner, 1989).
The second method of teaching is verbal demonstration. In verbal demonstration, the teacher is explaining the instructions while simultaneously demonstrating what is being explained. In this teaching method, visual, cognitive, and auditory senses are involved.

The third method of teaching is hands-on demonstration. Through hands-on demonstration, cognitive, verbal, proprioceptive, auditory, visual, and tactile senses are involved, increasing retention of information. Actively engaging in the learning event enables the development and integration of the sensory, motor, cognitive, and psychological systems (Fidler & Fidler, 1978). One of the founders of occupational therapy, William Rush Dunton (1928), spoke about the benefits of hands-on doing and how it enhances learning. Research by Fidler and Fidler (1978) showed that the human condition of self-actualization combined with sensory input and occupational purpose were instrumental for individuals to acquire and learn skills. The results of the Karlsson, Backman, Herlitz, Nilsson, Winbald, and Osterlind (1989) study indicated better recall for the hands-on group in healthy adults and adults with Alzheimer’s disease. The findings reiterate that encoding of learned information is a way to reinforce memory recall through the motor act, through sensory involvement and through existing, and acting in the present. According to Karlsson et al., (1989) when a multitude of sensory systems are employed, learning is more deeply encoded. This happens because the multiple senses reinforce each other thereby codifying the learning event.

Memory

Memory can be broken down into three separate stages or types: immediate memory, short-term memory with working memory, and long-term memory. Immediate memory is the ability to remember small amounts of information – typically seven elements - over a few seconds. Immediate memory makes sense of what is immediately perceived. Recalling a phone
number after it has been looked up is an example of immediate memory. Immediate memory store is limited and is also quickly lost (Cavanaugh & Blanchard-Fields, 2006).

Short-term memory with working memory is the ability to retain and recall recent experiences and events. Short-term memory with working memory is limited and temporary unless refreshed through rehearsal. Working memory is the term used for the processing of information from short-term to long-term memory. Working memory is the active processes and structures involved in holding information in the brain and simultaneously using that information, sometimes in conjunction with incoming information, to solve a problem, make a decision, or learn new information (Cavanaugh & Blanchard-Fields, 2006). Working memory is center to encoding, storage, and retrieval.

Long-term memory is the ability to recall skills, events, information, or experiences that were learned or occurred in the distant past. Long-term memory differs structurally and functionally from short-term with working memory. Long-term involves a physical change in the structure of neurons which is the mechanism by which short-term memories move into long-term storage. In the memory process, long-term memory is considered the permanent storehouse of retained information (Cavanaugh & Blanchard-Fields, 2006).

Memory and Aging

Aging does not affect immediate memory. At any age, people can typically store 5 to 7 pieces of information in immediate memory. Over time, even in the absence of neurological factors, long-term memory is subject to a natural fading process. In older adults, short-term memory with working memory is the stage most often affected as people age. Long-term memory can be improved through reflection or deliberate recall (Cavanaugh & Blanchard-Fields, 2006).
Normal age-related memory changes occur through the physiological aging of the brain’s cortex. The cortex shrinks and neurons shrink or atrophy. Normal aging causes a large reduction in the extensiveness of neurological connections. Less blood flow to the frontal cortex causes a decline in verbal fluency planning and organizing. Less blood flow to the parietal cortex decreases visual motor performance. Less blood flow to the medial temporal area affects the ability to make long-term memories (APA Online, 2006).

Relative to age differences, researchers have focused on three general steps in memory processing: encoding, storage, and retrieval. Encoding is the process by which information is put into the memory system. Storage represents how the information is represented and kept in memory. Retrieval is the process of getting the information back out of memory (Cavanaugh & Blanchard-Fields, 2006).

For older adults, research has focused more on encoding and retrieval as sources of age difference in memory performance than younger adults. Older adults commonly have problems remembering recent episodes and events as opposed to remote memories from the past (Cavanaugh & Blanchard-Fields, 2006). Research examining working memory capacity, speed of processing, and impaired inhibition offer some explanation as to why age differences in memory occur and why older adults remember less than younger adults. Contextual and social factors may also account for age differences (Cavanaugh & Blanchard-Fields, 2006). The literature on hands-on versus demonstration learning and its effects on memory will now be reviewed.

**Past Research on Hands-on versus Demonstration Teaching**

The use of hands-on versus demonstration to promote learning has been a principle of occupational therapy. The following studies imply that memory recall is enhanced through
hands-on learning. The purpose of these studies was to show whether or not hands-on learning would be more effective in processing the incoming stimuli into the sensory register (visual, auditory, etc.) followed by short-term memory processing, and, finally, processing into long-term memory store.

The purpose of Buddlemeyer’s (1995) research on free recall in children with learning disabilities was to determine if children with disabilities remembered more in a multisensory hands-on condition than those children that engaged in a demonstration condition. There were sixty participants in this study who had a learning disability and were between the ages of eight and thirteen years old. In the first condition, the children learned to make play-doh and in the second condition, the children were presented with the steps of making play-doh and were allowed to watch the researcher make play-doh. Recall was tested in both conditions at the conclusion of all ten steps in the play-doh making process with a three minute recall time limit. The researcher reported that individuals in the hands-on condition were able to remember more of the steps involved in making play-doh compared to individuals in the demonstration condition. The results supported the hypothesis that a multisensory hands-on condition enhances memory for children with disabilities.

Hartman, Kopp Miller, and Nelson (2000) researched whether children who engaged in hands-on learning would have better recall than children engaged in passive, demonstration learning. The 73 children who participated were healthy third-graders who either participated in a volcano making occupation or observed the making of a volcano occupation. Immediately following task completion, the children were asked to recall and state in their proper order as many of the 41 syntactical units that they could. Responses were tape recorded and scored blindly according to predetermined criteria. Children involved in the hands-on condition
recalled more of the information than children involved in the demonstration method. The study suggests hands-on occupation increases memory due to the enhanced tactile and proprioceptive input provided.

Messina (1999) researched the effects of hands-on versus demonstration on immediate and final recall in adults with mental disorders. It was hypothesized that participants who engaged in the hands-on condition of a cookie making occupation would score higher on immediate recall and final recall compared to participants in a demonstration group. Messina tested forty-eight individuals, randomly assigned to the two conditions. Adults in the demonstration condition were shown the steps for making no-bake cookies. Adults in the hands-on condition were shown and participated in making no-bake cookies. After the last step, adults in both conditions were tested on immediate recall. After fifteen minutes, adults in both conditions were asked to recall steps in the correct order. The findings in Messina’s study showed significant difference between individuals in the two conditions in terms of final recall, with individuals in the hands-on condition remembering more of the cookie making occupation than in the demonstration group. However, the study did not find a significant difference between the two conditions in immediate recall. Messina’s research implies that hands-on learning produces better recall for the test population than demonstration on long term memory only.

Farel (1996) hypothesized a difference between hands-on learning and demonstration learning on memory recall of adults with Cerebral Vascular Accident. The participants in this study were sixteen males and fourteen females between 52 and 86 years of age. With these participants, the study set out to compare the effects of hands-on occupation versus demonstration on spatial memory acquisition. In the first condition, participants were instructed
to hide 10 household items in 10 containers. In the second condition, participants watched the researcher hide the same 10 household items. In both conditions, after the items were hidden, the researcher asked three questions to serve as a distracter. The participants’ short term memory recall was tested by having the participants recall the items hidden in each of the 10 containers. If the participant could not remember where the items were, the researcher provided three items from which to choose. The results did not provide support that a brief hands-on experience results in better spatial memory than a brief demonstration. Overall, Farel’s study revealed no significant difference between the hands-on condition and the demonstration condition.

Hearns, Kopp Miller, and Nelson (2010) tested the effect of two teaching/learning methods on immediate memory, short term memory, and long term memory. Sixty university students participated in this study. Participants either observed the demonstration of no-bake cookies or engaged in the no-bake cookie occupation. The participants were read steps on index cards and then asked to read and repeat them back in the demonstration condition. For the hands-on condition, the participants did the same, except the participant performed along with the investigator. All statements were recorded and participants repeated the steps immediately, after washing dishes for 15 minutes, and also 24-48 hours later. Analysis of variance across the three levels of recall supported the hands on condition. However, at the three points of recall, the t-tests comparing hands-on to demonstration, only recall at the 24-48 hour mark was statistically significant. In terms of long-term memory, the study suggested hands-on learning might be of particular importance.

The Karlsson, Backman, Herlitz, Nilsson, Winbald, and Osterlind (1989) study investigated the results of free recall versus cued recall. Participants in the study were two groups of healthy adults and three groups of adults with Alzheimer’s disease. Members in each
group were randomly assigned to either the hands-on or verbal condition. The hands-on group’s recall memory was tested immediately after being presented with the simple, concrete motor tasks. Using verbal cues, the hands-on group was, again, immediately asked to recall as many of the twenty-five tasks as possible. The demonstration group was given written instructions describing the tasks. This group did not perform the tasks, but only read the tasks out loud. Immediately following the reading of the tasks out loud, the demonstration group was asked to recall the task using verbal cues provided by the investigator. Results indicated participants in the hands-on condition recalled more of the tasks than participants in the demonstration condition. Cueing given after immediate recall enhanced recall in the hands-on group.

Finally, Kluczynski’s (2002) research measured immediate, short-term, and long-term recall of hands-on versus demonstration in older adults from assisted living or independent living facilities. The fifty participants were divided into two groups of twenty-five. The participants were randomly assigned to either a hands-on group or a demonstration group. Individuals in the hands-on group were shown how and actually participated in making ice cream and individuals in the demonstration condition were simply shown how to make ice cream. The older adults were then tested on recall abilities immediately after the occupation, 15 minutes after the occupation, and then again at 24-48 hours after the occupation. There was no statistical significance found between individuals in the hands-on group versus individuals in the group demonstration for immediate, short-term, or long-term recall. Kluczynski’s study was unable to find a difference supporting hands-on as more effective than demonstration for immediate, short-term, or long-term recall with older adults.
The Current Study

Continued research on the topic of teaching methods is needed. Being able to reinforce the prevalence of hands-on versus demonstration is important in the career of occupational therapy. Past research has used varied populations such as young children with developmental disabilities, adults with Cerebral Vascular Accidents, community dwelling adults with mental disabilities, and older adults residing in assisted or independent living facilities. Past research implies hands-on teaching is more effective for immediate recall and in some cases, short-term and long-term memory, although the results are inconsistent. For older adults, the effects of hands-on versus demonstration on memory needs further study.

Karlsson, Backman, Herlitz, Nilsson, Winbald, and Osterlind’s (1989) research of free recall versus cued recall of subject-performed tasks and verbal tasks in healthy older adults and adults with Alzheimer’s disease indicated immediate recall was better in the hands-on condition and further enhanced when recall was cued. Kluczynski’s (2002) research was the second study to research long-term recall in the hands on versus demonstration condition and the first to study older, independent and assisted-living adults. Kluczynski had non-significant results in immediate, short-term, and long-term memory recall. Additional research involving memory recall in older adults is needed because research involving this population is limited. This current study investigated immediate, short-term, and long-term recall in older adults using the hands-on and demonstration conditions. It was hypothesized that there would be higher recall between the older adults who participated in the hands-on condition versus the demonstration condition in immediate, short-term, and long-term recall.
**Methods**

**Participants**

Twenty community dwelling adults 60 years and older without memory impairment were recruited for this study. The mean age of the participants was 67.80 years old ($SD = 5.56$) with a range of 60-85 years old. There were 9 males with a mean age of 68.66 and 11 females with a mean age of 67.09. Participants were drawn from the community at large. Individuals were screened for memory impairment prior to participation in the butterfly sun-catcher occupation test. The Mini-Mental State test (Folstein, Folstein, & McHugh, 1975) was used to screen for memory impairment. Participants scoring between 24 and 30 were included in the study. Participants scored a mean of 29 ($SD = .858$) on the MMSE. None of the participants tested positive for memory impairment, therefore, no one was excused from further participation in the study. Participants were asked if they had ever made a butterfly sun-catcher craft. If a participant said yes, he or she was excused from the study. No one had ever made a butterfly sun-catcher craft before, therefore, no one was excused from further participation in the study.

**Materials**

Materials used to determine eligibility for the study included the Mini-Mental State test (Folstein, Folstein, & McHugh, 1975) and a completed butterfly sun-catcher craft. The following materials were used during the craft portion of the study: 5” x 7” cards listing the steps of the occupation, crayons, a cheese grater, wax paper, scissors, an ironing board and iron, paper towels, hole punch, yarn and a butterfly cut-out shape for tracing. For the recall portion of this study, a stop watch was used to monitor the response time. Participant recall was taped using a tape recorder and cassette tape.
Procedure

All participants were asked to sign an informed consent form before the study began. Two conditions were used for this study: hands-on and demonstration. Participants were randomly assigned by a computer generated program to either the hands-on condition or the demonstration (verbal only) condition by the study’s assistant. The investigator administered both conditions of the independent variable.

In both conditions, the investigator began the craft and read the steps of the occupation aloud one step at a time. As each step was read, the investigator asked the participants to verbally repeat the step by reading the step off of the 5” x 7” card. Participants in the demonstration condition observed as the investigator performed the ten steps of the butterfly sun-catcher craft. Participants in the hands-on group observed and performed each of the ten steps of the butterfly sun-catcher craft along with the investigator.

When the study began, the hands-on group read the following instructions: “Thank you for participating in this study. We are going to make a butterfly sun-catcher craft together. I will tell you each step in sequence, one step at a time. After I say a step, I want you to repeat that step back to me out loud by reading the step from the card you have in front of you. Next, you will perform the step with me. Do you understand?” When the participants acknowledged their understanding of the instructions, the experiment continued.

For the demonstration condition, participants read the following instructions:

“Thank you for participating in this study. I am going to make a butterfly sun-catcher for you to take home. I will tell you each step in sequence, one step at a time. After I tell you each step, I want you to repeat the step back to me out loud by reading the step from the card in front
of you. I will then perform the step while you observe. Do you understand?” When the participants acknowledged their understanding of the instructions, the experiment continued.

All participants in both conditions were handed a 5” x 7” card with the ten steps printed on them. The investigator read each step out loud. Participants had five seconds to repeat the step out loud. If they did not, the investigator asked the participant to “Please say this step out loud to me.”

The ten steps for each condition were as follows:

1.) Trace a butterfly on wax paper using the pre-made shape;
2.) Shave several crayons of different colors;
3.) Put some of the crayon shavings on the wax paper inside the butterfly;
4.) Cover the butterfly with a piece of wax paper;
5.) Cover the butterfly with a paper towel; and
6.) Iron the butterfly for five seconds;
7.) Cut out the butterfly;
8.) Punch a hole near the top of the butterfly;
9.) String yarn through the hole;
10.) Tie a knot in the end of the yarn.

For both conditions, the materials used in the butterfly sun-catcher occupation remained out of sight behind a screen until they were needed to complete the step. After the materials were used and no longer needed, the materials were removed from view and put back behind the screen. The ironing board and iron were not in the room. They were brought in at step number six. Following completion of step number six, the ironing board and iron were removed from
the room. In the demonstration condition, the investigator completed each step in three minutes. Participants in the hands-on condition also completed each step in three minutes.

After each step in the occupation was read out loud, the investigator asked the participants to read the step out loud. The participants in the hands-on condition were reminded to complete the step with the investigator after the step was read aloud. Participants in the demonstration group were reminded to watch the investigator complete the step.

Following completion of the butterfly sun-catcher in both conditions, the investigator asked each participant three questions: “What is your favorite color?” “What is your favorite food?” and, “What is your favorite TV program?” Participants were allotted one minute to respond to these three questions. Questions were asked at this point of the study to minimize the possibility of rehearsal and to make sure there was a time consistency across both conditions.

Once each participant responded to the three questions, the participant was asked to tell the investigator how to make a butterfly sun-catcher using all of the steps in the sequence presented and by trying to use the words that were read. “Let me know if and when you cannot remember a step. I will be using a tape recorder to document your answers so that I can hear them again. May I record your response?”

If a participant declined to be recorded, he or she was excused from further participation in the study. For all participants who agreed to be tape recorded, the investigator responded:

“Please explain to me how to make a butterfly sun-catcher. Try to remember the exact words I said in the order I said them. You will have five minutes to recite the steps. Please proceed.”

As the participant went through the process of recall, the investigator used a stopwatch that was placed on top of the table. The investigator did not respond verbally or non-verbally to
the responses being given by the participant. Recording stopped if the participant indicated he or she could not recall any more steps. Ten seconds were allowed to transpire before the investigator prompted the participant by saying, “Try your best to remember.” If another ten seconds passed and the participant did not respond, he or she was asked, “Can you remember any more of the steps?” If the response was no, then the investigator stopped recording. If the response was yes, the investigator said, “Please tell the steps to me.” If the participant could not respond to this verbal prompt in ten seconds, recording ceased. In all conditions, participant’s responses were recorded immediately after completion of the butterfly sun-catcher, within 15 minutes of completing the occupation, and within 24-48 hours of completing the occupation. During the 15 minute span between immediate and short-term recall, participants were asked to read from a magazine of their choice. The 15 minute interval was enforced to ensure accurate measurement of immediate, short-term and long-term memory was occurring.

**Scoring**

The 10 steps had been divided into syntactical units. Each syntactical unit had been assigned a value of one point (see Appendix A). Participants could earn a full point per syntactical unit even if the exact wording of each step was not recalled (see Appendix B). This method of scoring would allow for substitution of functional synonyms. A functional synonym was defined as a “recalled word which is equivalent in idea or use to the exact imperative wording” (Eakman, 1992, p.21).

This study had 34 syntactical units arranged in 10 consecutive steps (2 to 4 units per step). The possible scoring range was 0 to 34. To score one point, the participant had to recall the syntactical unit or its equivalent within the proper sequence as defined by the consecutive steps. For example, in step eight, there were four syntactical units: “punch,” “hole,” “top,” and
“butterfly.” In order to get the full four points for this step, the participant had to use these words or designate synonyms in the proper sequence in relationship to the other steps. That is, the idea of punching a hole near the top of the butterfly had to precede the idea of stringing the yarn through the hole.

The participant did not need to use the exact words listed in Appendix A if synonyms were utilized. For example, it was correct to say “put,” “thread,” “pull,” “push,” or “tug” for the word “string.” The scoring guidelines for functional synonyms are listed in Appendix B.

Rules governing correct sequencing would protect against loss of all points if the participant made a sequence error at the beginning of the sequence. For example, if the first step was omitted, this would not result in all of the subsequent steps being judged incorrect. The units within a step were judged correctly sequenced when they were part of a correct sequence that maximized the participant’s score. If, for example, the participant left out all of step one (containing four syntactical units) credit was given for the remaining steps two through ten if they were recalled in the proper relative order. For a more complex example, if the participant recalled the occupation in the following order: 1, 2, 3, 4, 5, 7, 10, 9 (omitting steps 6 and 8), the participant’s score was maximized by crediting the syntactical units recalled in steps 1, 2, 3, 4, 5 were credited along with the correct units in steps 9 or 10, depending on the number of correct units recalled.

Results

Twenty older adults were recruited for the study and randomly assigned to either the demonstration or hands-on condition. Nine participants were assigned the demonstration condition and 11 participants were assigned the hands-on condition.
To establish interrater reliability, a research assistant, who was blind to the study and participant condition, independently calculated the syntactical units recalled of the 10-step butterfly craft for both conditions across all three points of recall. Interrater reliability was 99% agreement on all variables.

A p value of < .05 was set for all statistical testing. Participants in the hands-on condition had a mean immediate total recall score of 25.50 (SD = 3.70) and participants in the demonstration condition had a mean immediate total recall score of 21.50 (SD = 6.30). No significant difference was found between the two conditions in immediate total recall score (Z = -1.744) (p < .081).

Participants in the hands-on condition had a mean 15 minute later total recall score of 26.33 (SD = 5.05) and participants in the demonstration condition had a mean 15 minute later total recall score 20.37 (SD = 7.13). No significant difference was found between the two conditions in 15 minute later total recall score (Z = -1.821) (p < .069).

Participants in the hands-on condition had a mean 24-48 hour later total recall score of 26.16 (SD = 3.97) and participants in the demonstration condition had a mean 24-48 hour later total recall score 19.12 (SD = 6.83). A significant difference was found between the two conditions in 24-48 hour later total recall score (Z = -2.360) (p < .018).

**Discussion**

The purpose of this study was to compare a hands-on learning method with a demonstration only learning method on immediate, short-term, and long-term memory recall in community dwelling older adults. It was hypothesized that older adults in the hands-on condition would have higher recall scores for all three points of recall compared to older adults who were assigned to the demonstration only condition. Results of this study show that there
was not a statistically significant difference between the two conditions in immediate and 15 minute recall scores. However, at the 24-48 hour recall there was a statistically significant difference in memory recall for older adults in the hands-on condition versus the demonstration only condition. The participants in the hands-on condition recalled more of the syntactical units in the correct order compared to participants in the demonstration only condition.

For immediate recall, the implications of these results is opposite of previously conducted studies. For example, Buddlemeyer (1995) found that in immediate recall children with learning disabilities recalled more of the steps of making play-doh than children in the verbal only condition. Hartman, Kopp Miller, and Nelson (2000) found in immediate recall children involved in a volcano making occupation recalled more of the information than children who were involved in the observation only method. Lastly, Karlsson, Backman, Herlitz, Nilsson, Winbald, and Osterlind (1989) found that individuals in the hands-on group recalled more of the tasks than the demonstration group.

Similar to the current study, Kluczynski (2002) also researched older adults living in independent and supported living facilities. Unlike the current study which found higher recall at the 24-48 hour recall, Kluczynski’s study found no statistical significance between the two conditions at all three points of recall. Farel (1996) did not find a significant difference in short-term memory recall between the hands-on condition and the demonstration condition.

Other research studies that have reported long-term memory recall findings similar to the current study include that of Messina (1999) and Hearns, Kopp Miller, and Nelson (2010). Messina’s (1999) study found a significant difference between individuals in the two conditions at long-term recall. Individuals in the hands-on condition remembered more of the cookie making occupation than in the demonstration group. Hearns, Kopp Miller, and Nelson (2010)
found that university students who participated in the no-bake cookie occupation remembered more of the steps correctly at the 24-48 hour mark than the participants who observed the demonstration of no-bake cookies.

Similar to this study, the Karlsson, Backman, Herlitz, Nilsson, Winbald, and Osterlind (1989) and Kluczynski (2002) studies conducted research with older adults. However, Kluczynski (2002) found no statistically significant differences between the hands-on teaching method and demonstration method across all points of recall. Karlsson, Backman, Herlitz, Nilsson, Winbald, and Osterlind (1989) tested immediate recall only and found recall to be significant in the hands-on group. In regards to the current study, only recall at long-term was found to be higher in the hands-on group than those in the demonstration only group. These studies imply hands-on learning might be a more effective teaching method for older adults in regards to memory recall but continued research is necessary due to the variation of results with this population.

**Implications for Occupational Therapy**

Even though a statistically significant difference was not found between the two teaching methods for immediate and short-term recall, there was a higher recall for the hands-on group at 24-48 hour recall. When working with community dwelling older adults, using a hands-on teaching method might be more effective than demonstration only for long-term recall. A key principle of occupational therapy is that hands-on doing enhances learning (Dunton, 1928). Long-term memory is important because it enables the greatest amount of recall of skills and information learned during therapy.
Limitations

There were limitations to this current study that could have affected the overall outcome of this study. The first limitation was the participants were recruited from three different regions: Northwest Ohio, Northwest Pennsylvania, and Southwest Florida. Social, economic, and educational statuses of the three regions were dissimilar. Different facilities, distractions during testing, testing at different times of the day and week, all could have affected the outcomes.

Test anxiety may have been a factor with the participants. Anxiety can affect outcomes because it interferes with cognitive processes. Because none of the participants had made a butterfly sun-catcher craft before, anxiety resulting from an unfamiliar task might have negatively impacted memory recall for both groups. Another limitation was using a tape recorder when testing responses for both conditions at all three recall points. The presence and use of a recorder caused noticeable test anxiety and added pressure for some of the participants. Asking participations to act out (motor recall) the steps instead of verbally recalling the steps might be a less stressful way to determine if learning has taken place.

This study was administered by the investigator for both conditions of the independent variable. While the selection into the two groups was randomized and the investigation followed the same procedures for each participant, nonverbal cues such as a head nod or raised eyebrow might have occurred benefitting some participants.

The final limitation was the small number of participants. A larger pool would mean the sample group is more representative of the whole population. This study was small with only 20 participants making a Type II error highly possible for the variables of immediate and short-term recall.
Future Research

Future research should recruit participants from one targeted geographic location and conduct tests at one performance site. A targeted geographic location and testing environment could maximize continuity and minimize distractions. Future research might also consider narrowing the age range of the community dwelling older adults. The current study had an age range of 60-85. A participant pool of young-old adults (65-74) or old-old adults (75 and older) would be a more focused population. Previous research studies with more focused populations such as Messina’s (1999), Hartman, Kopp Miller, and Nelson’s (2000), and Buddlemeyer’s (1995) were able to reinforce the effectiveness of hands-on teaching.

Another recommendation for future research is to select an occupation that is more pertinent to this population. An occupation such as simple meal preparation might be more meaningful. This occupational form might trigger more naturalistic movements, feelings, motivation, and enhance learning.

Conclusion

Older adults in the hands-on condition recalled more of the syntactical units in correct order at the 24-48 hour recall point than older adults in the demonstration only condition. Previous studies with this population showed varied findings in recall in immediate, short-term, and long-term memory in the hands-on group compared to the demonstration only group. The effects of the hands-on versus demonstration teaching method needs further study to determine which method produces the best memory outcomes for community-dwelling older adults.
References


Appendix A

Task Step Imperative Scoring Format – Breakdown into Syntactical Units

Syntactical units are underlined. Each underline equals one syntactical unit. Each syntactical unit has a value of one point.

1 1 1 1

Trace a / butterfly on / wax paper using / a shape (4)

Shave several / crayons / of different colors (3)

Put some crayon shavings / on the wax paper inside / the butterfly (3)

Cover / the butterfly (OR wax paper) with a piece of / waxed paper (3)

Cover / the butterfly (OR wax paper) with / a paper towel (3)

Iron / the butterfly (OR paper towel) / for 5 / seconds (4)

Cut out / the butterfly (2)

Punch / a hole / near the top / of the butterfly (4)

String / yarn / through / the hole (4)

Tie / a knot / in the end / of the yarn (4)
Appendix B

Scoring Guidelines for Functional Synonyms

Each participant can potentially earn a full point score per each syntactical unit if the functional synonyms listed below are substituted for the exact task step imperative wording. No points will be deducted for using a different verb tense (i.e., “shaved” rather than “shave”) or if the participant uses the articles “a,” “an,” or “the.” The following list is an explanatory document containing synonyms and alternatively correct ways of wording which would indicate correct memory recall.

Trace a butterfly on wax paper using a shape

\texttt{trace=draw=color=write=mark=copy=outline}

\texttt{shape=figure}

Shave several crayons of different colors

\texttt{shave=grate=cut=chop=slice=scrape}

\texttt{different colors=separate colors=various colors=assorted colors=unlike colors=variant colors=unrelated colors}

Put some crayon shavings on the wax paper inside the bitterly

\texttt{shavings=bits=pieces=parts=flakes}

\texttt{inside=within=in=into}

Cover the butterfly with a piece of waxed paper

\texttt{cover=hide}

Cover the butterfly with a paper towel
Iron the butterfly for 4 seconds

Cut out the butterfly

Punch a hole near the top of the butterfly

String yarn through the hole

Tie a knot in the end of the yarn