EFFECTS OF ENVIRONMENTAL-BASED TASKS ON ENGAGEMENT, AFFECT, AND ACTIVITY PROGRESSION IN PERSONS WITH ALZHEIMER'S DISEASE

by

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Abstract

Alzheimer's disease is a neurodegenerative disease characterized by cognitive deterioration, changes in behavior, and impairments in memory, judgment, and decision making (Advokat, Comaty, & Julien, 2014; Bayles & Kim, 2003; Katzman & Saitoh, 1991). It is thought that these changes are the result of a decrease in the neurotransmitter acetylcholine throughout regions of the brain attributed to memory. Research has shown that while explicit memory is largely affected by Alzheimer's, implicit, or procedural memory, is still left in-tact (Adam, Van der Linden, Collette, Lemauvais, & Salmon, 2005; Guerdoux, Dressaire, Martin, Adam, & Brouillet, 2012; Monti et al., 1996). Environmental-based activities have been shown to have had positive impacts on those with dementia because they focus on everyday sensory and motor skills. It has also been shown that these activities have a positive impact on engagement and affect (Freidrich, 2009; Giroux et al., 2010; Padilla, 2011); however, there is a lack of standardization in the way that activities have been delivered and the manner in which behavioral data has been measured. The current literature also does not address whether or not individuals improve in these activities over time since they are rehearsed. This within-subjects study aimed to bridge the gap in the current literature and looked at the effect of one environmental-based task on engagement, affect, and activity progression in three adults with Alzheimer's disease. Results showed that for the first participant, the three dependent variables fit a quadratic trend. A regression curve estimation revealed significant results indicating that active engagement was related to both positive affect and progression over time. No findings were significant for the second participant, and the third was dropped from the study due to attendance. This study demonstrated the importance of tailoring these environmental-based tasks to a particular individual and his or her interests.

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Statement of the Problem

Alzheimer’s disease is a neurodegenerative disease, accounting for two thirds of all cases of dementia in the United States (Advokat, Comaty, & Julien, 2014; Alzheimer’s Association, 2011; Katzman & Saitoh, 1991). Alzheimer’s disease can only be determined postmortem by the presence of neurofibrillary tangles and plaques in the cortex and hippocampus. Prior to death, Alzheimer’s disease is characterized by cognitive deterioration, changes in behavior, and impairments in memory, judgment, decision making, orientation to physical surroundings, and language (Advokat et al., 2014; Bayles & Kim, 2003; Katzman & Saitoh, 1991). The neurotransmitter acetylcholine plays an important role in memory, and these cognitive symptoms are thought to be a result of decreased levels of acetylcholine in the affected regions (Advokat et al., 2014; Katzman & Saitoh, 1991). Multiple brain regions are associated with various aspects of memory, but only certain ones are affected by the decreased neurotransmitter levels.

While Alzheimer’s disease affects memory, it seems to primarily target specific components of memory. Explicit long-term memories are those that include factual information and information about past events of one’s life. These are affected to a much greater degree than implicit long term-memories: memories for how to do something and often called procedural memories (Adam, Van der Linden, Collette, Lemauvais, & Salmon, 2005; Coubard et al., 2011; Guerdoux, Dressaire, Martin, Adam, & Brouillet, 2012; Monti et al., 1996). It would make sense for the care and treatment of persons with dementia to include the enhancement of the aspects of memory that are still intact; however, that is not the case in many nursing home and rehabilitation facilities.

The cognitive symptoms of this disease result in a loss of functional independence and an increasing need for care (Advokat et al., 2014); this typically results in placement in long-term care facilities such as nursing homes and rehabilitation centers that can cost upwards of $30,000 per year for families as of 2014 (Alzheimer’s Association, 2015). Many of the activities provided for these individuals are not suited for dementia patients because they are not activities designed to promote an individual’s optimal level of functioning (Judge, Camp, & Orsulic-Jeras, 2000; Giroux, Robichaud, & Paradis, 2010); this can result in agitation, apathy, anxiety, and irritability (Judge et al., 2000; Padilla, 2011). Ideal activities are those that rely on implicit memories while actively engaging participants with their environment (Camp & Skranjer, 2004; Giroux et al., 2010). Environmental-based tasks have been developed to work with the implicit memories still intact in individuals (Camp & Skranjer, 2004; Freidrich, 2009; Giroux et al., 2010; Padilla, 2011; Skranjer et al., 2014; Vance & Porter, 2000); however, there is a lack of methodological standardization in how to deliver these activities and the way in which to collect the behavioral data, such as the benefits of daily use, common activities, etc. Engagement has mainly been assessed using nebulous observational techniques, which has been left up to the researcher on how to interpret. The current study aimed to assess and standardize the delivery and the data collection procedures for environmental-based activities for persons with moderate to advanced dementia.

Chapter 1- Introduction

Alzheimer's disease is the most common form of dementia and is characterized by memory loss that ultimately affects daily life. As the disease progresses, both cognitive and functional abilities decline (Alzheimer's Association, 2011). With the advances in medical technology to extend the lifespan well into the 80s, we can expect to see a comparable increase in rates of Alzheimer's disease. By the year 2030, new cases of Alzheimer's disease are expected to increase by 35 percent (Alzheimer's Association, 2015). There are currently few treatment options, as only the symptoms can be managed. Some pharmaceutical drugs can help slow the progression of symptoms for about 6 to 12 months, but not many additional treatment options exist (Alzheimer's Association, 2011). One characteristic of Alzheimer's disease is that it spares one's implicit memory or procedural memory (e.g., how to play the piano), even though their explicit memory (e.g., life events, factual information) is primarily affected (Adam et al., 2005; Guerdoux et al., 2012; Monti et al, 1996). In order to best help those with dementia, it is necessary to develop activities that rely on implicit memory in order to maximize social integration with the environment (Camp & Skrajner, 2004; Friedrich, 2009; Giroux et al., 2010; Judge et al., 2000; Padilla, 2011; Skrajner et al., 2014).

Previous studies have investigated different activity programs and tasks aimed to help those with Alzheimer's achieve the "best levels of physical, psychological, and social adaptation possible" (Camp & Skrajner, 2004, p. 426). Others have assessed cognitive processes that could relate to these activities' success (Adam et al., 2005; Coubard et al., 2011; Guerdoux et al., 2012; Monti et al., 1996).

Evidence of Cognitive Decline in Attention and Explicit Memory

Alzheimer's is a progressive disease that can be broken down into three stages: preclinical, Mild Cognitive Impairment (MCI), and dementia due to Alzheimer's. During the preclinical stage, patients do not show any cognitive or behavioral symptoms; however, there are changes that can be measured in the brain as many as 20 years prior to developing symptoms (Alzheimer's Association, 2015). MCI due to Alzheimer's is the symptomatic phase that occurs before dementia is diagnosed. MCI is usually diagnosed when there are small but measureable changes in thinking and cognition, but not enough to hinder daily living. Changes that are noticeable to family and friends are usually how this stage is diagnosed (Alzheimer's Association, 2015; Albert et al., 2011). The third and final stage is diagnosed dementia due to probable Alzheimer's; this stage is diagnosed when there are noticeable memory, thinking, and behavioral changes that interfere with day to day life (Alzheimer's Association, 2015; Albert et al., 2011). Adults aged 65 and older generally have 4 to 8 years to live after diagnosis, but it is possible to live with the disease for as many as 20. Death usually occurs from complications of the disease, such as pneumonia (Alzheimer's Association, 2015). Throughout the course of this disease, not all aspects of cognitive function are equally affected by the time moderate to severe dementia is reached.

Implicit or nondeclarative memory is an automatic process that does not require conscious effort (Guerdoux et al., 2012); it cannot be measured by stating an answer to a question, but can be expressed through task performance that is related to previous exposure with similar stimuli. Implicit memory includes various motor procedures such as riding a bike, habits and associations that are formed through conditioning methods such as stopping at a stop sign or red light, and priming which can be demonstrated by giving a favored response (such as a word) influenced by the previous administration of a related word or stimulus (Bayles & Kim, 2003). Explicit or declarative memory is a controlled process, meaning that it is effortful, conscious, requires attentional resources, and is usually measured using recall and recognition tests (Guerdoux et al., 2012; Monti et al., 1996). Types of explicit memories include stored factual information that can later be recalled and can be broken down into semantic memory, which is the recollection of general factual information such as knowing state capitals; episodic memory, which is the recollection of one's life events such as the time one visited a specific state capital; and lexical memory, which is the memory for words and their rules of usage (Bayles & Kim, 2003). Studies have also shown that processes related to memory, such as attentional control, also decline with the progression of dementia (Ashendorf et al., 2008; Coubard et al., 2011). Understanding how each aspect of memory is affected throughout the progression of Alzheimer's disease is essential for developing methods to help combat symptoms.

In a study by Coubard et al. (2011) on attentional tasks, it was found that normal aging was associated with some cognitive deficits such as dealing with uncertain events and occasionally switching attention (both in the context of cognitive tasks such as a verbal fluency task, Stroop task, trail making task, and rule shift cards). While normal aging was associated with decline in these abilities, all aspects of attention measured declined in participants with Alzheimer's disease. This suggests the possible benefits of starting tasks one at a time, in the simplest form, before moving on to more complex scenarios when working with those with forms of dementia (Coubard et al., 2011).

Studies using the trail making task (TMT) have shown that those with Alzheimer's have a more difficult time completing the task, as it involves switching attentional control (Ashendorf et al., 2008; Coubard et al., 2011). The TMT is a task in which a participant is asked to draw connecting lines from one circle to the next on a sheet of paper in order of the number drawn inside the circle (the circle with a one is connected to the circle with a two, and so on). The task becomes more difficult when the participant has to incorporate the alphabet and switch back and forth between successive digits and letters (the circle with the one is connected to a circle with an "A," which is then connected to one with a two and so on). One study compared healthy aging adults (control), adults with MCI, and those with probable Alzheimer's disease on a trail making test and found that in terms of errors, the control group differed significantly from the MCI and Alzheimer's groups, but the MCI and Alzheimer's groups did not differ from each other. Both error rates and time for completion were measured. Time for completion was influenced by age differences, but error rate was not. In this study, errors were thought to be a marker for impairment due to the fact that it was not influenced by age, yet the dementia groups scored significantly lower than the control group (Ashendorf, 2008).

Multiple studies have looked at both implicit and explicit memory and attempted to understand how each changes as aging occurs (Bayles & Kim, 2003; Dechamps et al., 2011). Previous literature suggests that implicit tasks are not all performed equally with dementia, so it is still somewhat unknown what parts of implicit memory stay intact when dementia progresses (Guerdoux et al., 2012; Monti et al., 1996). Many tasks that show intact priming in individuals with Alzheimer's are data driven, meaning that they rely on previous exposure to a stimulus (e.g., picture naming). Controlled processes, such as explicit memory, are usually tested using tasks such as an exemplar generation task in which participants have to use cued recall in order to name particular target items in a certain category. Knowing participants with dementia tend to have problems with recollection and cued recall (Guerdoux et al., 2012), Monti et al. (1996) hypothesized that during a test of priming, all participants would show more priming effects following a deep (semantic; e.g., meaning of the word) encoding session rather than a shallow (non-semantic; e.g., words written in all capitals). It was found that participants with mild to moderate Alzheimer’s generated fewer target exemplars than did age matched controls after a deep encoding session, and both groups responded more accurately in the non-semantic session, which also highlights the conceptual priming deficit these participants have. It is thought that since those with Alzheimer’s already have a reduced attentional capacity (Coubard et al., 2011), when they only had to look at the way the word was written, the only conceptual analysis that occurs is that which happens when any individual looks at a word. When they had to internalize the definition of a word, this requires a deeper conceptual analysis, something that those with Alzheimer’s begin to lose (Monti et al., 1996). While it is known that those with dementia have difficulties on a word learning task during cued recall and recognition, they do much better than when asked to freely recall presented words. This suggests that encoding has occurred, but these individuals have a difficult time accessing the information (Bayles & Kim, 2003).

Other studies have suggested that in Alzheimer’s dementia, episodic and working memory receive the most damage in comparison with the spared non-declarative systems. Studies have shown that semantic memories may also be somewhat spared, but the degree to which that is true is not well known (Bayles & Kim, 2003). With all of the evidence suggesting that explicit memory is lost while aspects of implicit memory are retained in those with dementia such as Alzheimer’s, ideal programs would be those that use those automatic processes and trigger feelings of familiarity (Adam et al., 2005; Bayles & Kim, 2003; Dechamps et al., 2011). The current study assessed participants that have reached moderate to severe dementia due to probable Alzheimer’s disease. Participants at this stage generally need fulltime care in a nursing home because the memories and thinking needed for independence are limited.

Implicit Memory and the Effectiveness of Environmental-Based Tasks

Previous research on activities that are well-suited for those with dementia have focused on environmental-based tasks and those that follow the Montessori method (Camp & Skrajner, 2004; Freidrich, 2009; Giroux et al., 2010; Judge et al., 2000; Padilla, 2011; Skrajner et al., 2014; Vance & Porter, 2000). The Montessori method was developed by Maria Montessori, who stressed the importance of self-paced learning and developmentally appropriate activities for children (Judge et al., 2000). The goal of environmental-based tasks is to tap into the parts of the brain that are still intact; if one is engaged in his or her environment, the individual may have a greater chance for maintaining some cognitive abilities. Both Montessori and environmental-based tasks have been shown to have positive impacts on those with dementia because these activities focus on skills of daily living (procedural memory), which is rewarding in the sense that it helps to establish feelings of autonomy (Dechamps et al., 2011); many of these tasks are also non-verbal, which is a benefit for a dementia patient who has trouble with verbal skills (Vance & Porter, 2000). Montessori and environmental-based tasks tap into procedural memory because they focus on tasks that were developed early on in life and have been practiced many times. A focus on errorless learning, which encourages the greatest chance of success and ultimately results in enhanced memory performance, is also a benefit of Montessori and environmental-based tasks. People often learn through trial and error methods as well. This method would not be suitable for someone with dementia because when mistakes are made, they may not be corrected and would likely be repeated; since repetition helps to consolidate memory, these individuals would likely continue to make the same mistakes (Bayles & Kim, 2003; Dechamps et al., 2011).

Research suggests that those with dementia lose cognitive abilities in the opposite order that they were obtained in childhood (Thornbury, 1993; Vance & Porter, 2000). Piaget’s theory of cognitive development says that people progress through four stages of intellectual development: the sensorimotor stage (birth-2 years of age), the preoperational stage (2-7 years of age), the concrete operational stage (7-11 years of age), and finally, formal operational stage (11+ years of age). According to Piaget’s theory, people learn object permanence and have the ability to recognize themselves early in life, while abstract reasoning techniques are developed later on. Research shows that people move backwards through Piaget’s model when they develop dementia (Thornbury, 1993; Vance & Porter, 2000). Object permanence and recognition of the self are the abilities retained when someone has dementia, while abstract thinking is usually the first to go (Vance & Porter, 2000). As Alzheimer’s progresses, individuals lose the ability to reason logically and problem solve, characteristics of the initial two stages of Piaget’s model.

Piagetian test scores have been shown to be highly related to MMSE scores; one study showed that those that placed into the sensorimotor or preoperational stage had MMSE scores of about 10 or less, which is suggestive of moderate to severe dementia (Thornburry, 1993). This suggests some benefit of activities that focus on procedural tasks of everyday life, such as brushing one’s teeth, simple cooking, folding clothes, or playing an instrument; they are tasks that an individual would have completed numerous times. Prior to the current study, there was no standardized way to deliver many of these activities. Many care facilities do not offer the kinds of activities best suited for those with this disease; when tasks are not at one’s optimal level of functioning, an individual can become anxious, agitated, aggressive, and even apathetic (Judge et al., 2000; Giroux et al., 2010).

Implicit or procedural memory is still strong in individuals with Alzheimer's; therefore, learning through repetition, and the progression from simple to more complex tasks, have been shown to have the most benefits for those using the programs in terms of overcoming cognitive deficits, affect, and engagement in activities (Freidrich, 2009; Padilla, 2011). Giroux, Robichaud, and Paradis (2010) demonstrated that there was a positive impact on both participation and affect when individuals were involved in a regularly administered activity; however, the impact was greater if the activity was a Montessori-type activity. Giroux et al.'s (2010) study also showed a positive correlation between participation in these activities and affect.

Two studies focused on training some Alzheimer's residents of an adult day care center to be group leaders for planned activities (Camp & Skrajner, 2004; Judge et al., 2000). Tasks were structured so that they were easily broken down and taught with guided repetition; both the trainees and participants in the games progressed from simple to more complex activities. Memory bingo was a task of choice in both of these studies, which allowed for social interaction among the participants and used repetition priming so that participants learned the game. Four types of engagement were assessed using observation by the researcher; they included constructive engagement (CE), passive engagement (PE), non-engagement (NE), and other engagement (OE). Constructive engagement can be defined as any behavior, verbal or motor, that is in response to the given activity. Passive engagement is described as listening or looking behavior that is in response to the activity at hand, whereas non-engagement refers to staring into space, keeping eyes closed, or sleeping. Other engagement is any other type of engagement not related to the activity; this would include talking to friends, etc. (Camp & Skrajner, 2004; Judge et al., 2000). Both of these articles found higher levels of CE and lower levels of PE than any other activity program; both studies had minimal incidences of NE and OE (Skrajner et al., 2014;

Judge et al., 2000). Alternatively, engagement can be measured for increments of time, such as 10-minute intervals used by Judge, Camp, & Orsulic-Jeras (2000). The benefit of measuring at intervals during a 10-minute time span is that the researcher can gain a more complete view of the time spent in each type of engagement for a session. The use of modeling has also shown some benefits for helping those with Alzheimer's (re)-learn activities of daily living. In comparison with errorless learning methods, a learning model showed the largest improvement in learning these activities at the time of assessment (Dechamps et al., 2011). These studies have many implications for working with adults with Alzheimer's in both long-term care facilities and even in the home. Montessori and environmental-based tasks have shown efficacy for engagement in those with Alzheimer's disease; however, there was a lack of standardization in both the way that tasks were administered and the way in which behavioral data such as engagement are measured. The current study aimed to bridge some of the gaps that existed in the recent literature.

The purpose of the present study was to standardize and evaluate the effects of one environmental-based task on engagement, affect, and activity progression in adults with Alzheimer's disease. Previous research has focused on the fact that environmental-based tasks work in order to enhance engagement and increase positive affect; however, there was limited standardization within activity administration, and measures of engagement. For the purposes of this study, one everyday task was used, which was broken down into 20 steps in order to evaluate participant progression; progression was recorded on an activity observation sheet. Affect and engagement were measured by two additional researchers and recorded using a subset of the positive and negative affect scales (PANAS) in a pencil and paper format, and using paper, pencil, and the operational definitions established in the behavioral observation of students in schools (BOSS; Shapiro, 2011) methodology, respectively. Each analysis was within participants, since there was not enough data to collapse across participants. We hypothesized (H1) that activity progression would increase from baseline, thus, we expected an overall increase from T_1 to T_{15}. It was also expected (H2) that participants would need less assistance as they progressed through the activity presented. It was further hypothesized (H3) that there would be an overall increase (T_1- T_{15}) in the percentage of time in active/constructive engagement. It was also expected (H4) that there will be an increase in positive affect over time. Lastly, we hypothesized (H5) that activity progression would transfer to the control activity, meaning that there would be an increase in progression from the first time the control activity was presented (T_1) to the second time (T_{15}). In addition to our five hypotheses, we had two exploratory hypotheses. The first was that we hypothesized (H6) a significant positive relationship between activity progression and amount of active/constructive engagement. Secondly, it was hypothesized (H7) that affect of the participant would be positively related to the amount of active/constructive engagement on a task. These hypotheses were based on previous research that suggested environmental-based tasks do improve levels of engagement and affect (Camp & Skrajner, 2004; Giroux et al., 2010; Judge et al., 2000); however, the degree to which activity progression improves is less well known.

Chapter 2- Method

Participants

The participants of this study were three persons with probable moderate to advanced Alzheimer's disease over age 60. This sample size is based on a within-subjects study design, and all participants were those that reside in nursing home care. Participants were given the MMSE at the first session in order to determine that they do in fact have moderate to severe, probable Alzheimer's disease. Other screening measures included confirming that the participant was able to see, hear, and have use of his or her dominant hand (these were evaluated through the administration of the MMSE since participants were asked to read, write, and follow commands). The sampling method for this study was a non-probability, convenience sample. Participants were recruited from a local nursing and rehabilitation center.

Apparatus/Materials

The Mini Mental State. Scores on the Mini Mental State Exam (Folstein, Folstein, & McHugh, 1975) were used to determine each participant's level of cognitive functioning at the beginning of the study. The Mini Mental State Exam is an untimed test, composed of 11 questions, and is divided into two sections. The first section includes vocal responses to questions asked by the researcher that pertain to orientation, attention, and memory (e.g., "What is the (year) (season) (date) (day) (month)?"). Point values are assigned to each question depending on how many answers the participant must give; a point is given for each correct answer, with the total possible points for this section being 21. The second section asks the participant to follow verbal and written commands, write a sentence, and copy a figure (e.g., "Take a paper in your right hand, fold it in half, and put it on the floor."). Points are awarded for completing each step successfully; the total number of possible points for this section is 9 (30 points for both sections together). The cut-off score for moderate to severe dementia is a score less than 20 (Folstein et al., 1975). Concurrent validity for the Mini Mental State was established by correlating scores with those of the Wechsler Adult Intelligence Scale. When correlated with the Verbal IQ $r = .776$ and when correlated with Performance IQ $r = .660$, the test-retest reliability for the Mini Mental State after an average of 28 days was .98 (Folstein et al., 1975).

Painting Observation Sheet. Researchers kept track of each participant's progression in environmental-based activities (see Appendix E). The observation sheet broke each task down into 25 steps with increasing difficulty (e.g., "Set a large paintbrush in front of participant and have them pick it up. If step is not completed, continue steps without brush (finger- painting)."). The researcher noted whether or not the step is completed, and then marked whether or not assistance was needed with either a "yes" or "no" in the next column.

Button Sorting Observation Sheet. Researchers tracked participant's progression on this control activity (see Appendix F) at time one and time 15. This sheet broke down the activity into 20 steps of increasing difficulty. The researcher recorded whether or not each step is completed, and then wrote whether or not assistance was needed with either a "yes" or "no."

Measure of Positive and Negative Affect (PANAS scales). Researchers used a subset of the PANAS scale (Watson, Clark, & Tellegen, 1988) in order to determine participant affect on activity delivery days (see Appendix G). The researcher reported the perceived affect of the participant on a scale of one to five (one being "not at all" and five being "extremely") for six different words (interested, distressed, enthusiastic, proud, irritable, and upset). This test has a high test-retest reliability for both positive and negative affect, .85 and .91, respectively (Watson et al., 1988). The internal consistency (Cronbach's alpha) for positive affect for Participant One was .74 and .96 for negative affect. For Participant Two the internal consistency reliability was .87 for positive affect and .96 for negative affect.

Engagement: Behavioral Observation of Students in Schools (BOSS). This was used to measure type and degree of engagement in activities in which the participants took part (see Appendix H). The BOSS methodology was developed for teacher use in the classroom to measure the engagement of students (Shapiro, 2011); however, it was used in this study to measure the engagement of the participants. The method for collection of engagement data was developed from the pencil and paper BOSS observation method (Shapiro, 2011) and used the same operational definitions. BOSS allowed the researcher to classify engagement in five different ways. Active engaged time (AET) was defined as time when the participant was actively participating in the activity at hand. Passive engaged time (PET) was defined as the participant listening or watching the given activity, but not actively engaging in the activity. Off task motor behavior (OFT-M) was described as motor activity that is not related to the activity assigned (e.g., touching other objects). Off task verbal (OFT-V) was any verbal behavior that was unrelated to the task, such as talking about family, talking to a friend, etc. Off task passive (OFT-P) described any passive behavior that was not attending to the task (e.g., staring off, listening to others talk, etc.). This methodology allowed the researcher to be able to make observations about percentage of time in AET, PET, OTF-M, OFT-V, and OFT-P, for 15-minute long sessions at 15-second intervals. Using this data, the researcher was able to calculate the percentages of time spent both on and off task. Validity and reliability for the original pencil and paper method have been previously established (Shapiro, 2011). Pilot testing occurred in advance to ensure that researchers were categorizing behaviors in the same way in terms of engagement (see Appendix B). Two researchers measured engagement using the BOSS methodology in order to calculate interrater reliability.

Procedure

Participants were given an informed consent agreement that had to be signed by their legal guardian, and the participants needed to give verbal assent in order to participate (Appendices C & D). At the beginning of the study, participants were given the MMSE in order to determine their level of cognitive functioning; this was also used to help determine at what step the individual would start on the activity. The first few steps on the activity sheet could be bypassed for those with higher cognitive functioning due to the fact that the steps would be too easy for them. To avoid a ceiling effect, additional steps past the first 10 were created so that participants could attempt to progress through 10 full steps throughout the study if they began on a step past step one. After the MMSE was completed, participants were given a painting activity to complete (Appendix I). During the activity, two researchers measured engagement for 15 minutes at 15-second intervals using the BOSS method established by Shapiro (2011). Two trained assistants made observations so that inter-rater reliability could be calculated (see Appendix B for training methodology). One researcher administered the subset of the PANAS in order to measure each participant's affect. The directions for each activity were listed in 20 steps (unique to each activity) on the activity observation sheet, and each activity session began with a demonstration so that participants knew what they were supposed to be doing. While the researcher was observing a participant for 15 minutes, every 15 seconds the researcher wrote down AET, PET, OTF-M, OFT-V, or OFT-P depending on how the participant was engaged in the activity at that given moment. This allowed for the creation of a data set with the percentage of time spent in each type of engagement throughout the administration of the activity. The researcher instructing the participant filled out the observation sheet while interacting with the participant. The researcher recorded whether or not each step was completed by the participant, and noted whether or not help was needed by the participant in order to complete the step. Data were collected for 15 minutes total to allow a sufficient amount of time for participants to complete the activity; the goal was for the participants to move as far along as possible, independently, in the activity to show progression from baseline without cutting participants off due to time constraints (see Table 1 for outline of study design). Participants were only given help when they could not continue an activity on their own. The process of giving the activity to the participant and measuring both affect and engagement took place three times a week for 5 weeks. The painting activity was delivered using the same method each session.

In order to address our fifth hypothesis, a control activity (equivalently the same in terms of degree of difficulty) was given at the initial session and at the final testing session in order to determine if activity progression transfers to other related activities or just the one that the participant had been working on consistently for the 5 weeks. A button sorting task was used as the control activity for this study. This task was used as a control because it uses the same sensory and motor functions that are used in everyday activities, similar to painting. The control activity also consisted of 20 steps, to avoid a ceiling effect for those that already started out above step number one.

Statistical Analysis Plan

This study is based on the results from two case studies. Once the data were received, they were cleaned in order to make sure there was no missing or inaccurate data. If participants missed more than two consecutive sessions, they were allowed to continue the study, but we did not use their data in the final analysis.

Inter-rater reliability was collected throughout the course of this study when analyzing the data for both affect and engagement. Two assistants were trained using the BOSS methodology so that they reached no less than an 80 percent agreement when determining engagement of the participants. In order to determine inter-rater reliability, we used the intra-class correlation (ICC) method since we used ratio data with two raters.

Descriptive statistics (mean and standard deviation) were obtained for affect, engagement, and activity progression; it was hoped that a change would occur over time with repeated exposure to the activities, but with a small sample size we were not able to collapse across data to measure anything. A plot for each person was created in terms of individual progression on each of the dependent measures (affect, engagement, and activity progression) in order to see if there were changes at each session as time increased. A plot for assistance was also created. Correlations between activity progression and engagement were analyzed since one hypothesis stated that they would be positively correlated; engagement was also hypothesized to be positively related to affect, so correlations were done to determine that relationship as well. Correlations between activity progression on the activity that the participant completed every week and the progression on the activity given only at time one and ten were analyzed to determine if activity progression on one was correlated with activity progression on the other, less practiced activity. Individual growth regression curve estimations were run for each participant in order to determine how the percentage of time spent in AET related to the other dependent variables, positive affect and progression, over time.

Chapter 3- Results

Participant One

Participant One was a female with an MMSE score of 14.5. Descriptive statistics were measured for each of the dependent variables: progression (*M* = 11.67, *SD* = 6.83), positive affect (*M* = 2.82, *SD* = 0.92), and percentage of time spent in AET (*M* = 67.78, *SD* = 40.45). Descriptive statistics were also collected for assistance (*M* = 5.25, *SD* = 3.74), negative affect (*M* = 1.51, *SD* = 0.74), and percentage of time spent in PET (*M* = 20.44, *SD* = 34.88), OFT-M (*M* = 0.45, *SD* = 0.76), OFT-V (*M* = 2.78, *SD* = 3.20), and OFT-P (*M* = 0.22, *SD* = 0.86; see Table 2). Cronbach’s alpha was calculated as a measure of internal consistency reliability for the positive and negative affect scales. The positive affect items had a Cronbach’s alpha of .74, while the negative items had a Cronbach’s alpha of .96. An ICC was run in order to determine interrater reliability since multiple assistants were used to collect data. The ICC for each session ranged from .64 to .97 and averaged .84 across sessions.

The first hypothesis stated that progression on the activity would increase from the first session to the last session; this trend held true at the beginning of the study. Progression leveled off in the middle of the study, and then dropped off at the end of the study. From Figure 1 it can be determined that H1 was not supported for this set of data. The second hypothesis stated that the amount of assistance needed by the participant would decrease from the first session to the last session. Figure 1 also shows that this was not the case for this participant; as the participant switched to more difficult painting activities, she needed more help until she learned to complete the task on her own. The need for help at each new step resulted in the fluctuations apparent in Figure 1 for the line representing assistance. There was not enough evidence to support H2 for this participant. The third hypothesis was that there would be an increase in the percentage of time spent in active engagement for the participant as she moved through the activity. This data, as shown by Figure 2, also fits the same trend as progression first increasing, leveling off, and then decreasing. From the trend of the graph illustrated in Figure 2, we can conclude that H3 was not supported. The fourth hypothesis specified that positive affect would increase over time as well. Figure 2 shows that positive affect also fit the same trend as the other dependent variables, suggesting there is not enough evidence to accept H4. Lastly, H5 stated that activity progression would transfer to the control activity, thus resulting in an increase in progression from the first time the control activity was presented to the last time it was presented. According to Figure 1, progression did not increase from the first time the control activity was presented to the last time the control activity was presented; thus, H5 was not supported.

Two exploratory hypotheses were addressed throughout this study. The first (H6) was that there would be a significant positive relationship between progression and the time spent in AET. As shown in Table 3, this hypothesis was supported, $r = .55, p < .05$. The second exploratory hypothesis (H7) stated that affect would be positively correlated with the time spent in AET. Table 3 also shows that this hypothesis was supported, $r = .77, p < .01$.

In order to further explore the relationship between the variable AET and the variables positive affect and progression, regression curve estimation analyses were calculated. Regression curve estimations test the null hypotheses that, at the individual level, (a) the percentage of time spent in AET is not significantly related to the positive affect shown by the participant over the course of the study, and (b) the percentage of time spent in AET is not significantly related to progression in the activity over time. If the null hypotheses were rejected, then further analysis of curve estimation results would reveal what trend best fit the relationship among the study variables.

Two regression curve estimations were calculated for each participant. Fifteen points of data were included in each analysis. Results found that Participant One had a significant relationship between percent of time spent in AET and positive affect. Table 4 displays the results from the statistically significant curve estimation. Figure 3 shows that the relationship between time spent in AET and positive affect was best described by a quadratic function, $R^2 = .64$, $p < .01$. Results also showed that for Participant One there were significant relations between percent of time spent in AET and progression in the activity (see Table 5). Figure 4 shows that the relationship between AET and progression was best described by a quadratic function, $R^2 = .71$, $p < .01$.

Participant Two

Participant Two was a male with an MMSE score of 9. Descriptive statistics were measured for each of the dependent variables: progression ($M = 21.25$, $SD = 3.67$), positive affect ($M = 3.47$, $SD = 1.03$), and percentage of time spent in AET ($M = 68.78$, $SD = 10.12$). Additionally, descriptive statistics were measured for assistance ($M = 2.08$, $SD = 2.23$), negative affect ($M = 1.33$, $SD = 0.85$), and the percentage of time spent in PET ($M = 9.53$, $SD = 9.08$), OFT-M ($M = 19.20$, $SD = 7.08$), OFT-V ($M = 1.38$, $SD = 3.29$), and OFT-P ($M = 1.12$, $SD = 2.43$; see Table 6). Cronbach's alpha was calculated to measure internal consistency reliability of the positive and negative affect scales; they had a Cronbach's alpha of .87 and .96, respectively. An intra-class correlation was run in order to ensure that there was high inter-rater reliability; the ICC for each session ranged from .65 to .99 and averaged .89 across all sessions.

The first hypothesis stated that progression would increase from the start of the sessions to the end of the sessions; Figure 5 shows that progression increased at the beginning of the study, it plateaued, and then decreased again. This was similar to the trend seen with the first participant and also shows that this hypothesis was not supported. The second hypothesis stated that assistance would decrease over time, and as shown in Figure 5, this hypothesis was not supported. The amount of assistance needed actually increased during session 11 compared to what was needed in other sessions. H3 predicted an increase in the percent of time in AET throughout the course of the study. Participant 2 showed more variability in the amount of time spent in AET than the first participant, and it did not increase over time as had been predicted (Figure 6). H4 projected that there would be an increase in positive affect over time as well. While it appeared as though there was a linear relationship between session number and affect, the participant still did not demonstrate a clear relationship between these two variables, meaning H4 was not supported (Figure 6). Lastly, it was predicted (H5) that activity progression would transfer to the control activity after the study had been completed. The second participant was able to complete more steps the second time doing the activity compared with his performance at the start of the study; however, the magnitude of difference between the two sessions was not large enough to draw a conclusion that progression transferred to the control activity.

Two exploratory hypotheses were addressed in this study. The first exploratory hypothesis (H6) stated that there would be a positive relationship between progression and the percentage of time spent in active engagement. Table 7 shows that this relationship was not significant, $r = -.09$, $p > .05$. The second hypothesis (H7) stated that affect would be positively related to the percentage of time spent in AET. Table 7 also shows that the relationship between these two variables was not significant, $r = .03$, $p > .05$.

Regression curve estimations were also calculated for Participant Two; again, all 15 points of data were used for both curve estimations. Results showed that there were not significant relations between time spent in active engagement and positive affect throughout the course of the study. Results also showed that the amount of time spent in AET was not significantly related to progression throughout the course of the study.

Third Participant

This study included a third participant, but due to low attendance and willingness to participate, her data had to be dropped from the study. Her MMSE score was 18; the cut-off for moderate to severe dementia is any score less than 20, but she was at a much higher functioning level than the other two participants. This particular participant did not enjoy painting like the first two participants did, which only strengthens the notion that these activities have to be tailored to an individual’s preferences and optimal level of functioning. This particular participant would have much rather watched television or slept than participate in painting. Had the activity been something she enjoyed more, she may have been willing to participate. After missing more than two consecutive sessions, this participant’s data was dropped from the study.

Summary of Results

All of the primary hypotheses for both participants were not supported. Overall, the data show that the dependent variables of progression, affect, and engagement were not linear, and the data do not look the same for each individual. Each individual was different, and their progress using these everyday activities will look very different depending on their cognitive abilities. The regression curve estimation analyses and exploratory hypotheses only showed significant results for the first participant. Again, this speaks to how very different participants can be in terms of their progression with dementia. No major conclusions can be drawn from the data collected in this study.

Chapter 4- Discussion

The purpose of this study was to standardize and evaluate the effects of one environmental-based task on engagement, affect, and activity progression in adults with probable Alzheimer's disease. Environmental-based activities have shown to have positive effects on affect and time spent in active engagement for adults with dementia (Freidrich, 2009; Giroux et al., 2010; Judge et al., 2000; Padilla, 2011). The first hypothesis was that progression on an activity would increase from the first session to the last session; this hypothesis was not supported for either participant. Figure 1 shows that for the first participant, there was a positive linear trend for progression for the first third of the sessions. The participant then appeared to level off; there was a negative linear trend for the final few sessions. This trend is in opposition to previous research suggesting that progression from simple to more complex tasks gets better with each session (Freidrich, 2009; Padilla, 2011). As the participant completed the last few sessions, she appeared to either have become bored, or habituated, to the painting activity. It is also possible that she realized she was not improving on the activity, which resulted in decreased progression, positive affect, and engagement. The second participant followed the same trend as the first participant with progression increasing, leveling off, and then decreasing (see Figure 5). The second participant may also have become bored with the activity because he was higher functioning in terms of his motor skills; the activity may just have been too easy for him.

The second hypothesis stated that assistance would decrease from the first session to the last session. Figure 1 shows that this hypothesis was not supported for Participant One. The trend for assistance fluctuated from decreasing to increasing regularly. One explanation for this trend in the data is that as each new step was reached, the participant needed help to learn how to do that particular step. Once that step was learned, it became easier for the participant and resulted in less assistance until it was time to increase to the next step in difficulty, at which point more assistance was needed again. Figure 5 shows that there was less fluctuation in assistance needed with Participant Two than there was with Participant One. The second participant did not need as much assistance on each step of the activity; as previously mentioned, it is possible that the activity might not have been challenging enough.

Studies by Freidrich (2009) and Padilla (2011) showed that tasks broken down from simple to more complex tasks, like environmental-based activities, have benefits for actively engaging the participant, as well as increasing positive affect. These two studies provided the basis for Hypotheses 3 and 4. Hypothesis 3 stated that there would be an increase in the percent of time spent in active engagement. Hypothesis 4 stated that there would be an increase in positive affect over time as well. As Figures 2 and 6 show, both of these variables show the same trend as progression for each participant. The variables increased at the beginning of the study, plateaued, and then decreased at the end of the study. These trends in the data, again, suggest that the participant may have become bored, or habituated, to the painting activity. For example, if the participant decreases in affect because he/she is bored with the activity, it would make sense that progression and the amount of time spent in active engagement would also decrease. In terms of engagement, each participant was considered to be on task a majority of the time (see Table 2 for Participant One and Table 6 for Participant Two). Each participant was on task about seventy percent of the time. The types of off-task behaviors, however, were very different for each participant. When not on task, Participant One was most likely to be passively engaged; she would often tell the researchers that she wanted one of them to do the painting, and she would watch. Participant Two was more likely to be off-task motor. Future research will need to tailor ways to reengage participants once their attention is diverted based on their type of off-task behavior, or they will need to choose activities that encourage more on-task behaviors for that specific individual. For example, if a participant does not enjoy painting, the individual may be more likely to divert his or her attention elsewhere.

The fifth hypothesis indicated that activity progression would transfer to the control activity; thus, there would be an increase in progression from the first time the control activity was presented to the last time the control activity was presented. Figures 1 and 5 include data for the first and last data collection sessions (control sessions), and showed that there was not much of an increase in activity progression; thus, this hypothesis was not supported. Previous research has shown that adults with dementia generally have a hard time with switching tasks once they learn a task or switching rules within a task once they learn those specific rules (Ashendorf et al., 2008; Coubard et al., 2011). The fact that this hypothesis was not supported fits with the previous research regarding success in progression once a task is switched. It seems to be that the learning that occurs is very task specific.

Two regression curve estimations were run for each participant. The first assessed how much the percentage of time spent in AET related to positive affect over time. The second assessed how much the percentage of time spent in AET related to activity progression over time. Both of these regression curve estimation analyses were significant and best fit a quadratic trend for the first participant, but not for the second. The second participant had no significant results. These results could be a function of the participant's cognitive abilities. The second participant was much higher functioning in terms of his ability to complete the painting activity. He tended to vary in his amount of time spent in AET, but generally was in a positive mood. Additionally, he always finished the painting activity, regardless of his amount of time spent in AET. This could be because he was higher functioning in terms of cognitive abilities; he could have spent just enough time actively engaged in order to finish the activity. The first participant was very much actively engaged a majority of the time, but she progressed through the steps of the activity at a slower rate than the second participant. Progression, in this situation, was related to how much she was actively engaged. Additionally, if she was in a more positive mood she would work to finish the activity for the day, thus spending more time in active engagement. The regression curve estimation results make sense for Participant One. Overall, whether or not significant results were obtained for the regression curve estimations may depend on the activity being at the optimal level for the participant. In this situation, the painting task may have been too easy for Participant Two.

Exploratory Hypotheses

The first exploratory hypothesis (H6) was that there would be a significant positive relationship between progression and time spent in AET. This hypothesis was supported for the first participant, but not for the second participant. Furthermore, the second exploratory hypothesis (H7) stated that affect would be positively related to the amount of time spent in AET on a task. This hypothesis was also supported for only the first participant, and makes sense given the results previously stated regarding the regression curve estimation analyses.

Summary of Findings

Previous research has shown that implicit or procedural memory is spared in those with Alzheimer's disease (Adam et al., 2005; Guerdoux et al., 2012; Monti et al., 1996). Environmental-based activities are believed to show the most benefits for affect and engagement because they focus on activities have been done many times throughout the lifetime (Freidrich, 2009; Padilla, 2011). The painting activity in this study uses fine motor skills that would have been developed throughout the individual's life. Previous research also suggests that environmental-based activities work because of the repetition in presentation of the task, the breaking down of tasks from simple to more complex, and the modeling that takes place during each step of the activity (Coubard et al., 2012; Dechamps et al., 2011). This study was conducted in a manner that emphasized those three qualities. A study by Giroux et al. (2010) showed a positive correlation between participation in the activities and affect. The results in this study did not show the same findings as previous research in regard to affect and engagement. Affect and engagement may be a function of both the participant's interest in the activity and his or her cognitive abilities.

The methodology for collecting data on engagement was similar to that used in two previous studies in which environmental-based tasks were administered to adults from an adult day care setting. Both studies found higher levels of constructive or active engagement and lower levels of passive engagement than was found with any other activity presented (Camp & Skrajner, 2004; Judge et al., 2000). Moreover, one of the studies measured engagement at 10-minute intervals in order to give a more complete view of the time spent in each type of engagement (Judge et al., 2000). The current study was adapted from Judge, Camp and Orsulic-Jeras's (2000) methodology in order to obtain a greater picture of the individuals' engagement. Rather than measuring in 10-minute intervals, this study measured engagement every 15 seconds for 15 minutes. Results from previous research suggesting improvement on the amount of active engagement were not replicated throughout this study.

After conducting this study, it is evident that when switching activities, the new activity will have to be started from the beginning (i.e., just because the participant became bored or disengaged on step 10 of one activity does not mean the researcher should begin on step 10 with a different activity). Previous research has shown that adults with dementia have a difficult time switching tasks (Coubard et al., 2012); these previous findings have been replicated in this current study in rejecting the fifth hypothesis stating that activity progression would transfer to the control activity.

Limitations and Future Directions

One limitation in regard to this study is that the MMSE was used in order to assess cognitive functioning at the beginning of the study. This was supposed to be used in order to establish the point at which the participant would start on the painting activity. Future research should use another measure that does not rely heavily on verbal skills. Research has shown that environmental-based activities work well for individuals that have lost verbal abilities (Vance & Porter, 2000). It does not make sense to assess an individual in a way that emphasizes verbal ability if the majority of skills used in environmental-based tasks are non-verbal. In this particular study, Participant Two scored much lower on the MMSE than Participant One because he was mostly non-verbal and had a difficult time communicating with the researchers. However, Participant Two had much greater motor abilities than Participant One and surpassed her in progression on the activity. In order to gain a more accurate picture of cognitive abilities, an assessment that does not rely as heavily on verbal abilities should be used when assessing the participants at intake.

Another limitation to this study is that the data are composed of two case studies. In order to gain insight into how well these activities actually work, more participants would be needed. In the future, an experimental design should be utilized to see how well these environmentalactivities work in comparison to activities that are already currently offered at a nursing home facility. A study with an experimental design would be a second step to this body of research. Additionally, more activities are needed because not every individual will enjoy painting. More pilot studies testing the standardization of alternate activities will be useful in creating a program that caregivers can use. As this study has shown, there is a point at which the participant may become bored with an activity, and it would also be beneficial to have alternate activities to introduce when this happens. This would hopefully prevent negative changes in scores on variables such as activity progression, affect, and amount of time spent in AET. Future research should also examine the use of environmental-based activities in the home with caregivers. Environmental-based activities have the potential to be delivered by a caregiver or family member once more activities are developed and broken down into standardized steps for easy delivery.

Overall, our study cannot make definitive conclusions across participants about the effectiveness of painting as an environmental-based activity. However, it does support the idea that individually tailored activities, presented at appropriate difficulty levels, may have an impact on affect, engagement, and activity progression.

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Appendix A

Table 1

Type of Task: IV/ Predictor 3x per 5 weeks

DV	T_1 x	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}	T_{15} x
Activity Progression	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Assistance	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Control Activity (X)	—														—
Affect	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Engagement	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note. This table outlines the design of this study; it was a repeated-measures, within-subjects design. Activity X (button sorting) served as a control measure to determine if participants improve on a less repeated task after repeated exposure to three other tasks on a regular schedule. Assistance refers to the number of times per session that an individual needed help on an activity. Engagement refers to the percentage of time in active/constructive engagement.

Table 2
Means and Standard Deviations for Variables

	Mean	**Standard Deviation**	**Minimum**	**Maximum**
Progression	11.67	6.83	1.00	19.00
Positive Affect	2.82	0.92	1.00	4.00
Negative Affect	1.51	0.74	1.00	3.33
Assistance	5.25	3.74	0.00	12.00
Percent AET	67.78	40.45	0.00	100.00
Percent PET	20.44	34.88	0.00	95.00
Percent OFT-M	0.45	0.76	0.00	1.67
Percent OFT-V	2.78	3.20	0.00	11.67
Percent OFT-P	0.22	0.86	0.00	3.33

Note. Table contains the means and standard deviations for participant 1.

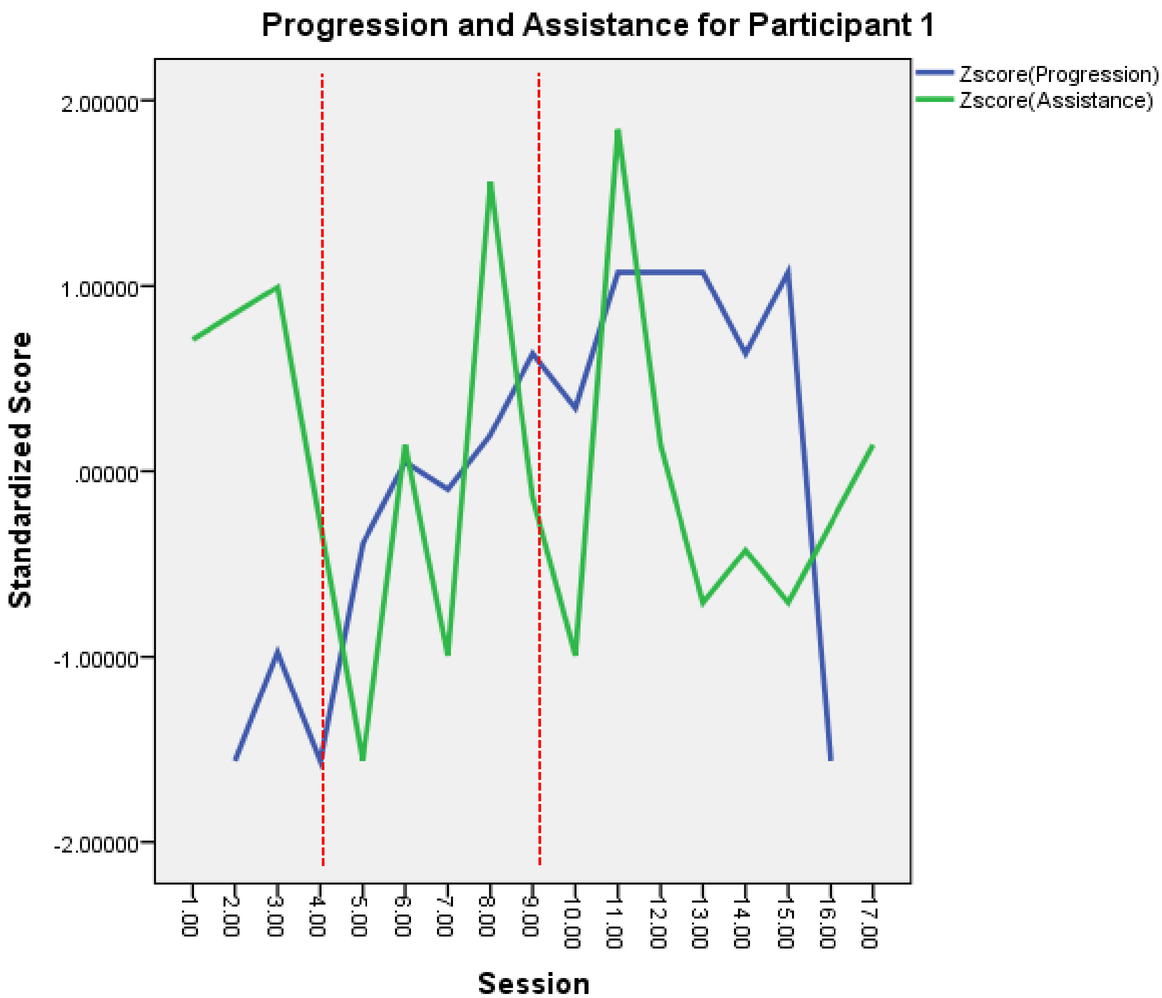


Figure 1. Progression and Assistance for Participant One. This figure illustrates the progression and assistance needed for Participant One over the course of the 15 sessions and two control sessions. Sessions 1 and 17 were control sessions. Standard scores were used for this graph. Dotted lines indicate where a new picture was administered, signaling an increase in difficulty of the activity.

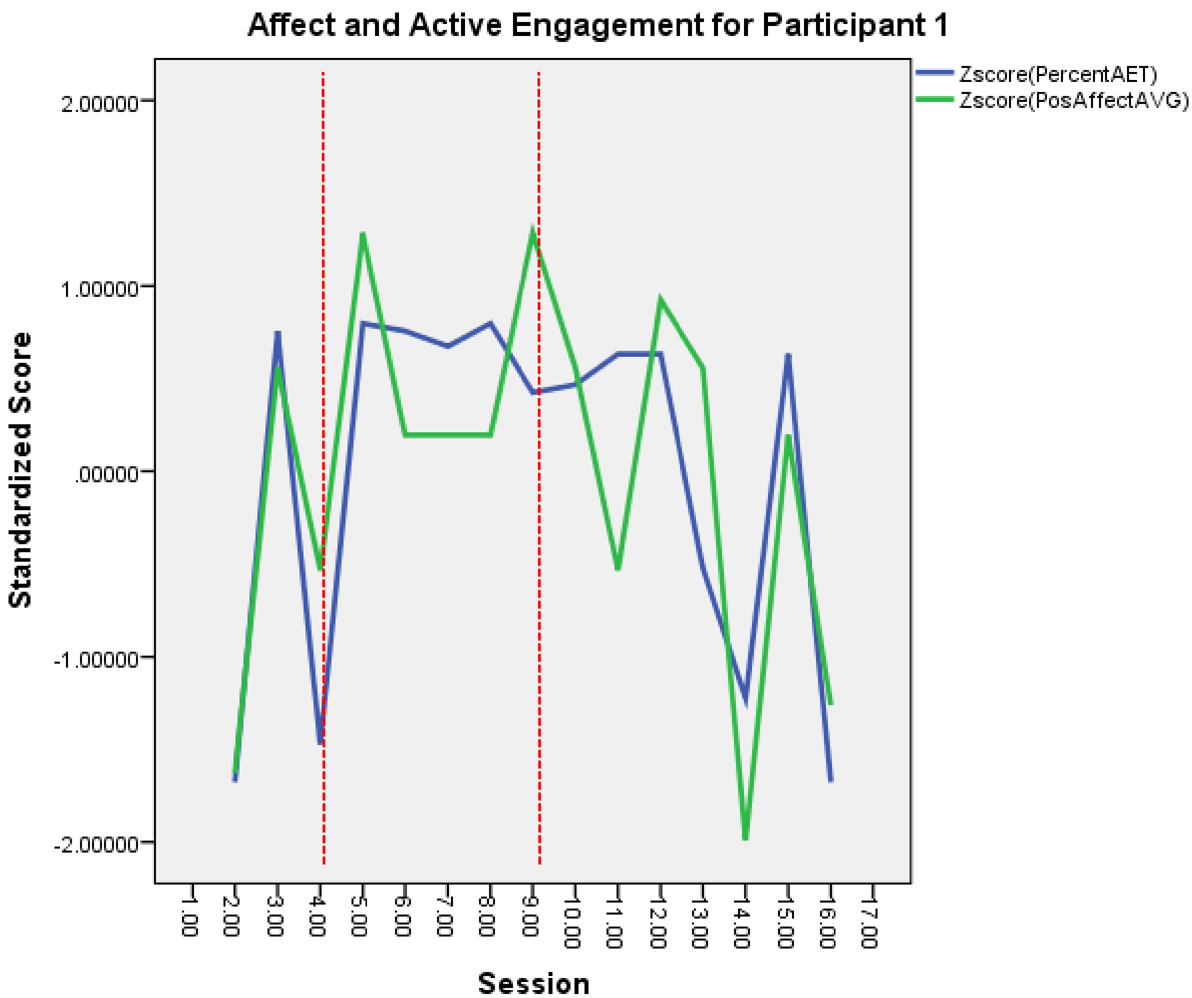


Figure 2. Affect and Active Engagement for Participant One. This figure illustrates affect and the percentage of time in active engagement for Participant One over the course of the 15 sessions and two control sessions. Sessions 1 and 17 were control sessions. Standardized scores were used for this graph. Red lines indicate where a new picture was administered, signaling an increase in difficulty of the activity. Dotted lines indicate where a new picture was administered, signaling an increase in difficulty of the activity.

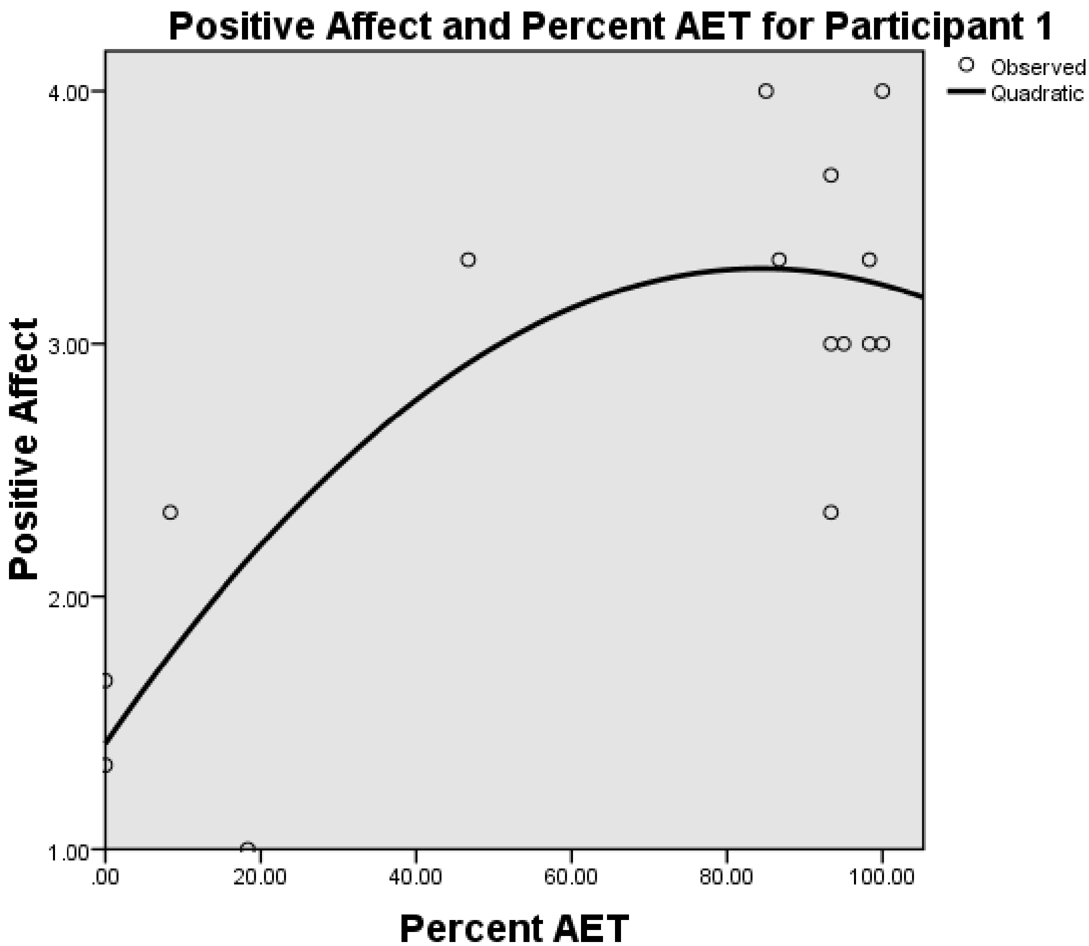


Figure 3. Positive Affect and Percent AET for Participant One. This figure illustrates the quadratic function represented by the relationship of percentage of time in AET predicting positive affect.

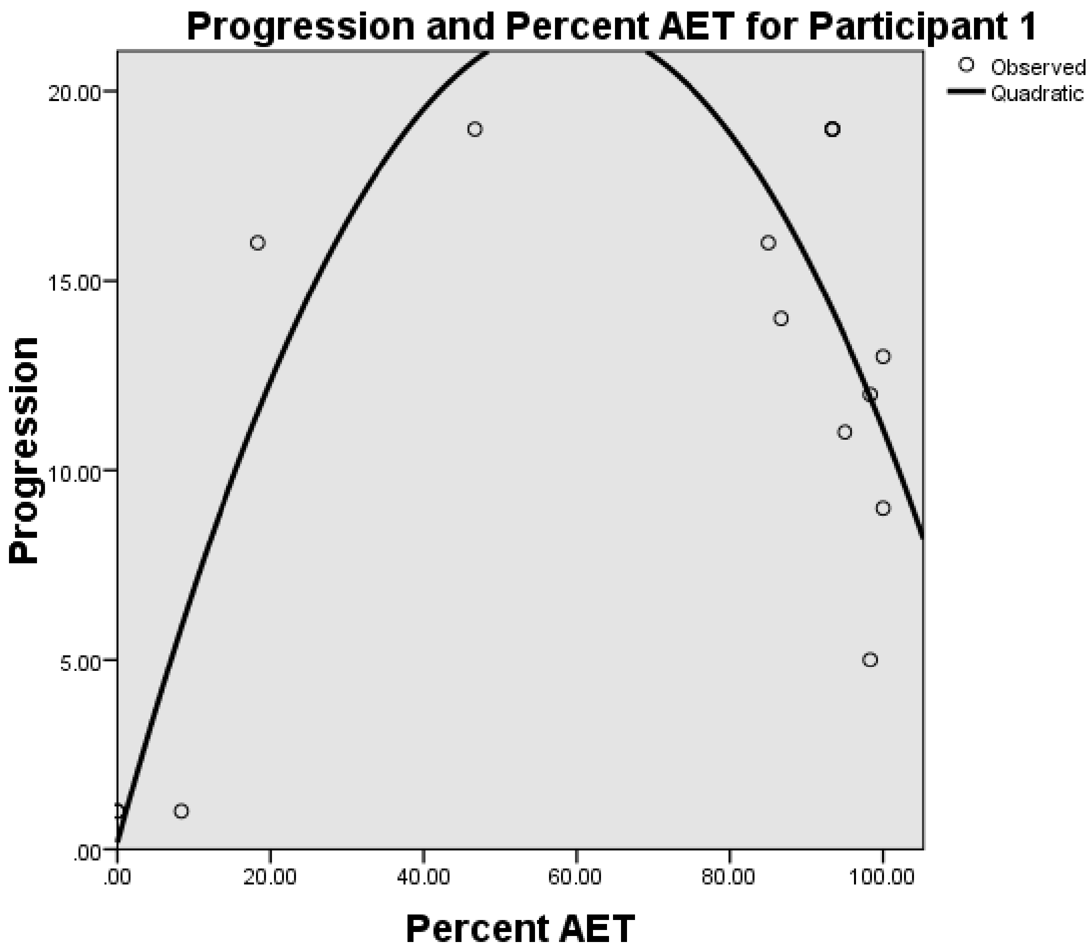


Figure 4. Progression and Percent AET for Participant One. This figure illustrates the quadratic function represented by the relationship of percentage of time in AET predicting progression on the activity.

Table 3
Correlations Between Variables (N = 15)

Measure	Positive Affect	Percent AET	Progression	Assistance
Positive Affect	**---**			
Percent AET	**.77****	**---**		
Progression	**.38**	**.55***	**---**	
Assistance	**-.23**	**.23**	**.04**	**---**

*Correlation is significant at the .05 level.
**Correlation is significant at the .01 level

Note. This table of correlations between the variables is for Participant One.

Table 4
Regression Curve Estimation for Percent AET and Positive Affect for Participant One.

Function	B	SE B	β	R^2	F
Quadratic				.64	F(2,12) = 10.54, $p < .01$
Percent AET	.05	.02	1.97		
Percent AET	.00	.00	-1.21		

$^*p < .05$, $^{**}p < .01$

Note. This table shows the results from the regression curve estimation for percent AET and positive affect.

Table 5

Regression Curve Estimation for Percent AET and Progression for Participant One.

Function	B	SE B	β	R^2	F
Quadratic				.71	F(2,12) = 14.80, $p < .01$
Percent AET	.73	.16	4.34**		
Percent AET	-.01	.00	-3.84**		

*p < .05, **p < .01

Note. This table shows the results from the regression curve estimation for percent AET and progression.

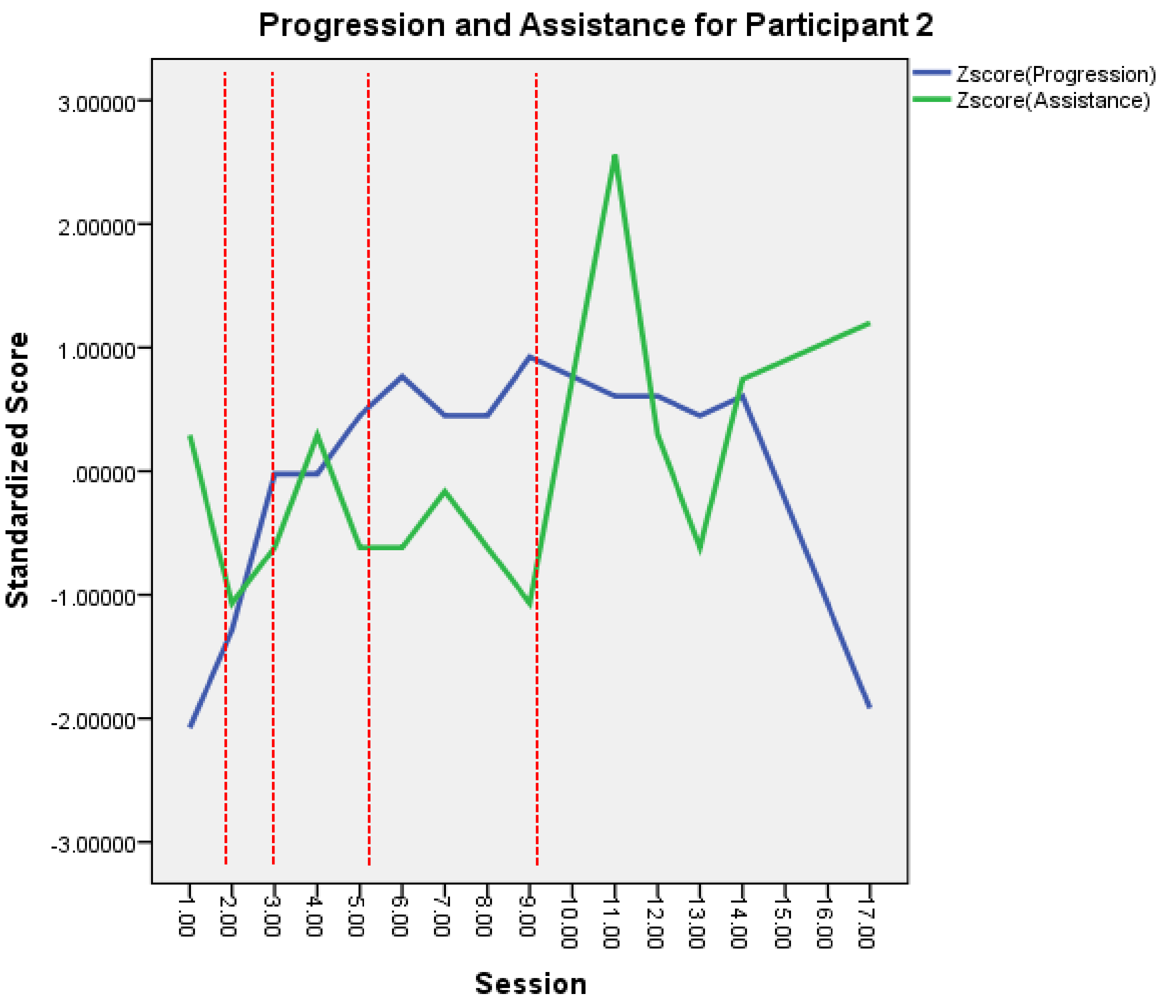


Figure 5. Progression and Assistance for Participant Two. This figure illustrates affect and the percentage of time in active engagement for Participant Two over the course of the 15 sessions and two control sessions. Sessions 1 and 17 were control sessions. Standardized scores were used for this graph. Dottted lines indicate where a new picture was administered, signaling an increase in difficulty of the activity.

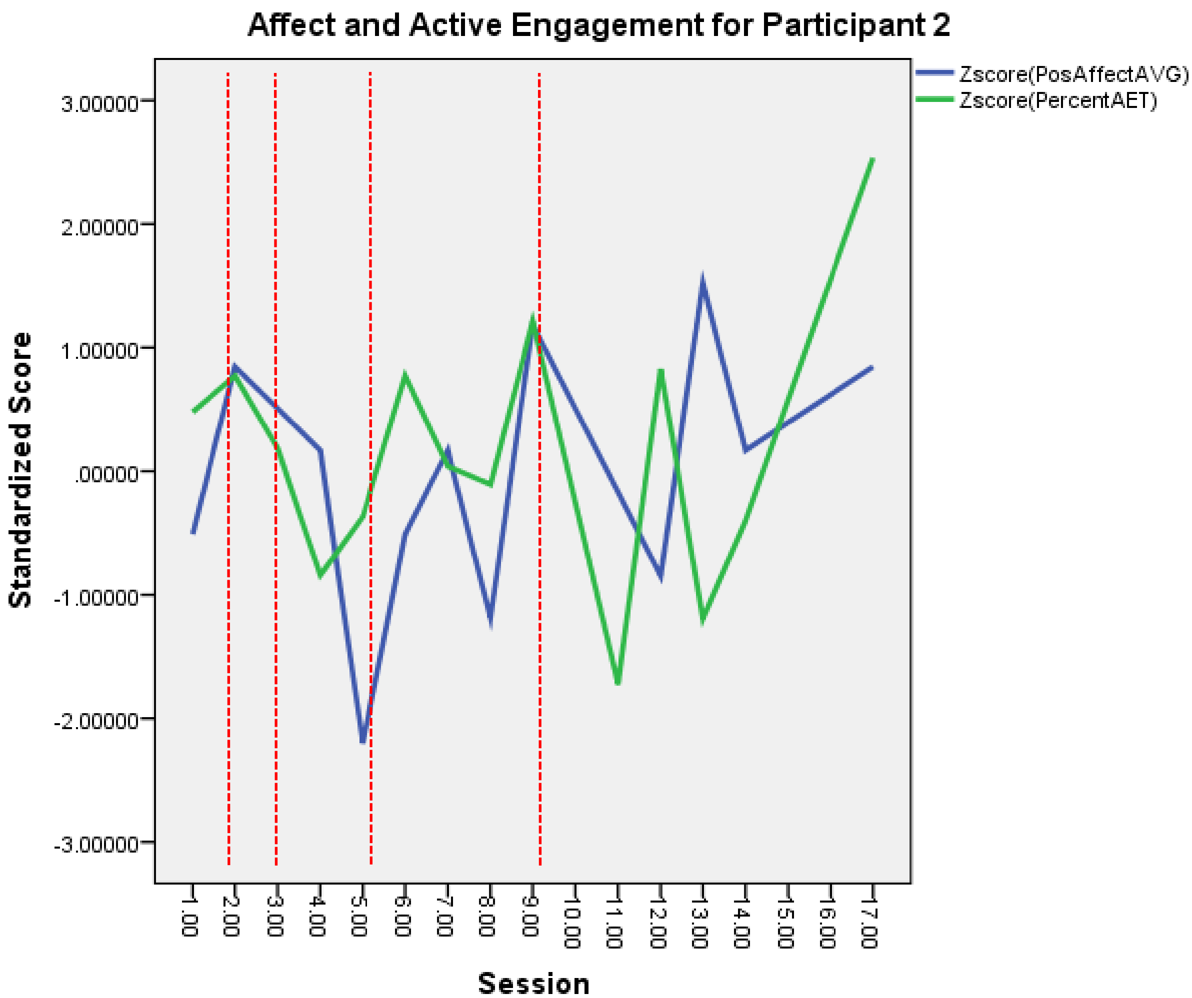


Figure 6. Affect and Active Engagement for Participant Two. This figure illustrates affect and the percentage of time in active engagement for Participant Two over the course of the 15 sessions and two control sessions. Sessions 1 and 17 were control sessions. Standardized scores were used for this graph. Dotted lines indicate where a new picture was administered, signaling an increase in difficulty of the activity.

Table 6

Means and Standard Deviations for Variables

	Mean	Standard Deviation	Minimum	Maximum
Progression	21.25	3.67	11.00	25.00
Positive Affect	3.47	1.03	1.33	5.00
Negative Affect	1.33	0.85	1.00	4.00
Assistance	2.08	2.23	0.00	8.00
Percent AET	68.78	10.12	50.00	83.33
Percent PET	9.53	9.08	0.00	30.00
Percent OFT-M	19.20	7.08	8.33	30.00
Percent OFT-V	1.38	3.29	0.00	11.54
Percent OFT-P	1.12	2.43	0.00	7.89

Note. Table contains the means and standard deviations for Participant Two.

Table 7
Correlations Between Variables (N = 15)

Measure	Positive Affect	Percent AET	Progression	Assistance
Positive Affect	**---**			
Percent AET	**.03**	**---**		
Progression	**-.24**	**-.09**	**---**	
Assistance	**-.14**	**-.66***	**.26**	**---**

*Correlation is significant at the .05 level.
**Correlation is significant at the .01 level.

Note. This table of correlations between the variables is for Participant Two.

Appendix B

Training of Research Assistants

There were five assistants that were trained to collect data on engagement throughout the course of this study. Assistants watched YouTube videos of toddlers completing tasks in order to practice coding the operational definitions for the different types of engagement. Since toddlers move around and switch tasks at a much faster rate than older individuals, we used videos of young children rather than videos with older adults, which were much more difficult to find. The research assistants went through five 1-hour-long training sessions in which they had to watch a few videos and code the behaviors of the toddlers at 15-second intervals, just like the study. Training was completed until research assistants consistently reached an 80 percent agreement for each video.

Appendix C

Informed Consent for Care Recipient with Moderate to Advanced Dementia

If you cannot give legal consent to take part in this study because you may have trouble reading or understanding this consent form, then the researcher will ask for your assent. Assent is your agreement to be in the study. The researcher will explain the study to you in words that you can understand. You should ask questions about anything you don't understand. Then you should decide if you want to be in the research study. If you want to participate, you and someone who can sign a legal document for you must sign this form before you take part.

Explanation of the Study

Hello, my name is Michaela Reardon and I am a graduate student in charge of this research study. Here with me is Jenessa Steele, an Associate Professor of Psychology at Radford University, and Taylor Conyers and Olivia Sheetz, our undergraduate research assistants.

This research study is looking at how repeatedly working on everyday tasks will improve your mood, interest level, and success with the activity provided. You are being asked to participate in this study because your guardian has told us you have dementia or probable Alzheimer's Disease. For this research study, you will be asked to fill out a survey including vocal responses, following directions, and some writing in order to better understand your current memory abilities. We will then invite you to participate in a painting activity with us. While we paint, two of our research assistants will observe your mood and interest level in the activity. After this meeting, one of us, along with two of our research assistants will visit you three times a week for 30 minutes for five straight weeks. During this time, we will work on our painting activity while our assistants observe your mood and interest level in the activity and will pose no harm or risk to you. We will show you how the painting activity works and ask if you would like to complete the activity with us. You do not have to complete any part of the study that you do not want to. You may refuse to complete any part of this study without penalty.

Do you have any questions about this research study? If you have any questions throughout the research study, your caregiver may contact Dr. Jenessa Steele at 540-831-5361.

Would you like to participate? If you agree to participate, you may sign below, or you may provide verbal assent by saying 'Yes' or nodding your head.

You agree to participate:

____ ____________________

Subject's Printed Name and Signature Date

____ ____________________

Printed Name and Signature of Principal Investigator Date

______________________________________ ________________

Printed Name and Signature of Witness Date

If you are not the subject, please print your name:

___________________________________ and indicate one of the following:

_____ The subject’s guardian

_____ A durable power of attorney

_____ Other, please explain:________________________________

Appendix D

Primary Caregiver/Legal Guardian Consent of Participant Care Recipient

Effects of Environmental-Based Tasks on Engagement, Affect, and Activity Progression in Persons with Alzheimer's Disease

Researcher(s): Michaela Reardon, B.A. Graduate Student, Dr. Jenessa Steele, (Associate Professor of Psychology), Taylor Conyers, and Olivia Sheetz.

As the Legal Guardian, you are being asked to allow your adult care recipient with dementia to participate in a research study that will help me to complete my thesis. This form provides you with information about the study. The person in charge of this research will also describe this study to you and answer all of your questions. Please read the information below and ask any questions you might have before deciding whether or not to take part. Your adult care recipient's participation is entirely voluntary. Your adult care recipient can refuse to participate without penalty or loss of benefits to which they are otherwise entitled. You can stop your adult care recipient's participation at any time and your refusal will not impact current for future relationships with Radford University or participating sites. To do so simply tell the researcher you wish to stop participation. The researcher will provide you with a copy of this consent for your records.

Study Purpose: This research study is looking at whether working on everyday activities (using fine motor skills) repeatedly over time improves engagement, affect, and activity progression. Your care recipient is being asked to participate in this study because he/she has dementia, or probable Alzheimer's Disease. For this research study, at our first meeting, we will ask your care recipient to complete the Mini Mental State exam (MMSE) in order to get a better understanding of their current cognitive and memory abilities, as well as make sure that he/she can see, hear, and use their dominant hand. We will then invite your care recipient to participate in a painting activity and button sorting activity while two of our research assistants observe his/her affect and engagement while completing the activities. Next, one of us, along with two of our research assistants, will visit your care recipient at the residence three times a week for about 30 minutes for five straight weeks. During this time, we will invite your care recipient to paint with us while our research assistants observe his/her affect and engagement and will pose no harm or risk. Your care recipient does not have to complete any part of the study that he/she does not want to. Your care recipient may refuse to complete any part of this study without penalty. Total estimated time for your care recipient to complete this study is approximately 7 hours.

There is no compensation from being in this study.

There are no direct benefits to your care recipient for being in the study.

You can choose not to have your care recipient participate in this study. If you decide to allow your care recipient to participate in this study, he/she may choose not to answer certain questions or not to be in certain parts of this study.

If you decide to allow your care recipient be in this study, what he/she tells us will be kept private unless required by law to tell. If we present or publish the results of this study, his/her name will not be linked in any way to what we present.

The records of this study will be stored securely and kept confidential. Authorized persons from Radford University, members of the Institutional Review Board, have the legal right to review your care recipient's research records and will protect the confidentiality of those records to the extent permitted by law. All publications will exclude any information that will make it possible to identify your care recipient as a subject. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to allow your care recipient to remain in the study.

Contacts and Questions:

If you have any questions about the study please ask now. If you have questions later, want additional information, or wish to withdraw your care recipient's participation call Dr. Jenessa Steele conducting the study at 1-540-831-5361. If you have questions about your care recipient's rights as a research participant, complaints, concerns, or questions about the research please contact Dr. Dennis Grady, Dean, College of Graduate and Professional Studies, Radford University, dgrady4@radford.edu, 1-540-831-7163.

You will be provided a copy of this consent form.

You are making a decision about allowing your adult care recipient to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow him or her to participate in the study. If you later decide that you wish to withdraw your permission for your adult care recipient to participate in the study, simply tell me. You may discontinue his or her participation at any time.

____
Printed Name of Adult Care Recipient

____
Printed Name of Parent(s) or Legal Guardian

_________________________________ _________________
Signature of Parent(s) or Legal Guardian Date

_________________________________ _________________
Signature of Investigator Date

Appendix E
Painting

Step	**Was step completed? (Y/N)**	**Assistance Given? (Y/N)**
1. Ask participant if they would like to paint.		
2. Set a piece of construction paper in front of participant. Have participant touch the paper.		
3. Set a large paintbrush in front of participant and have them pick it up. If step is not completed, continue steps without brush (finger-painting).		
4. Set paint of 1 color in front of participant. Ask participant to put the brush into the paint and move the paint around. If step is not completed, help the participant move the brush to the paint.		
5. Have the participant move the brush to the paper. Repeat steps 4 & 5 until the page is filled up with paint.		
6. Give participant a piece of paper with a large, simple image such as a circle or square and ask if they would like to paint the image. Have participant touch the image.		
7. Repeat steps 3 & 4.		
8. Have the participant move the brush to the paper and paint the large image. If this is too difficult, go back to step 2.		
9. Have participant repeat steps 4, 5, & 8 until the image is filled with paint.		
10. Repeat steps 6-9 with a smaller brush in order to help with motor skills.		
11. Give the participant a piece of paper with a more complex image such as a star and ask if they would like to paint the image. Have participant touch the image.		
12. Repeat steps 4, 5, & 8 until the image is filled with paint.		

13. Repeat steps 11 &12 with a smaller brush in order to help with motor skills.		
14. Give the participant a piece of paper with a more complex image such as a flower that involves more than 1 color. Ask if they would like to paint the flower.		
15. Set 2 or more colors in front of the participant. Ask participant to put the brush into the paint and move the paint around. If step is not completed, help the participant move the brush to the paint.		
16. Have the participant use the first color to paint the center of the flower.		
17. Ask the participant if they would like to wash the brush out in a cup of water. Give assistance if needed.		
18. Ask the participant if they would like to use a second color to paint the petals of the flower. Have the participant touch all of the petals on the flower.		
19. Have the participant dip the paint in the second color and transfer paint to all of the petals on the page.		
20. Repeat steps 16-19 with a smaller brush to help with motor skills.		
21. Ask the participant if they would like to paint a picture of a car. Set 3 colors in front of the participant. Give the participant a medium size brush.		
22, Have the participant paint each feature of the car using the 3 colors.		
23. Ask the participant if they would like to paint a fish. Set 3 colors in front of the participant. Give the participant a medium size brush.		
24. Have the participant paint using the first color. Then rinse the brush out with water.		
25. Have the participant repeat step 24 until all the colors have been used and the fish is painted.		

Appendix F
Buttons

Step	Was step completed? (Y/N)	Assistance Given? (Y/N)
1. Ask participant if they would like to help you sort some buttons of various sizes and colors.		
2. Place buttons in front of participant and ask them to touch the buttons.		
3. Place 2 cups in front of the participant. Ask the participant if they can help you sort buttons by color. Start with 2 colors. Put the buttons into the 2 different cups. Give an example to start.		
4. Place 3 cups in front of the participant. Ask the participant to sort buttons into 3 different sizes (S, M, L). Give the participant an example of each. Place each size into a different cup.		
5. Place the buttons in front of the participant and ask if they can help you sort buttons by color. Start with 3 colors. Put the buttons into the 3 different cups. Give an example to start.		
6. Ask the participant if they would like to help you make a pattern using buttons. Show them a pattern using 2 different buttons (e.g., blue, green, blue, green). Have them repeat.		
7. Repeat step 6 (pattern) using 3 different colored buttons.		
8. Repeat step 5 (color) using 4 different color buttons.		
9. Repeat step 6 (pattern) using 4 different color buttons.		
10. Repeat step 5 (color) using 5 different colored buttons.		
11. Repeat step 6 (pattern) using 5 different color buttons.		
12. Ask the participant if they would like to help you thread some large buttons.		
13. Give the participant a piece of large thread and have them pick up a button.		
14. Have them thread the large button. Make sure to demonstrate first.		

15. Put two different colored large buttons in front of the participant and two pieces of thread that match each of the buttons. Ask the participant to match the color thread with the color button. Place the button next to the correct color thread.		
16. Have the participant thread each of the buttons with the correct color string.		
17. Repeat steps 13 & 14 with a medium size button.		
18. Repeat steps 15 & 16 with a medium size button.		
19. Repeat steps 13 &14 with a small button.		
20. Repeat steps 15 & 16 with a small button.		

Appendix G

Activity Behavioral Observation Sheet

Name of Activity Deliverer & assistants:
CRUID (CareRecipientUniqueID)
Date:
Time:

1. Indicate perceived resident affect with the task.

Word	1 – Not at All	2 – A Little	3 – Moderately	4 – Quite a Bit	5 - Extremely
Interested	1	2	3	4	5
Distressed	1	2	3	4	5
Enthusiastic	1	2	3	4	5
Proud	1	2	3	4	5
Irritable	1	2	3	4	5
Upset	1	2	3	4	5

OTHER COMMENTS/NOTES:

Appendix H

Directions: Indicate the participant's engagement using the numbers given, every 15 seconds for 15 minutes as indicated by the recording.

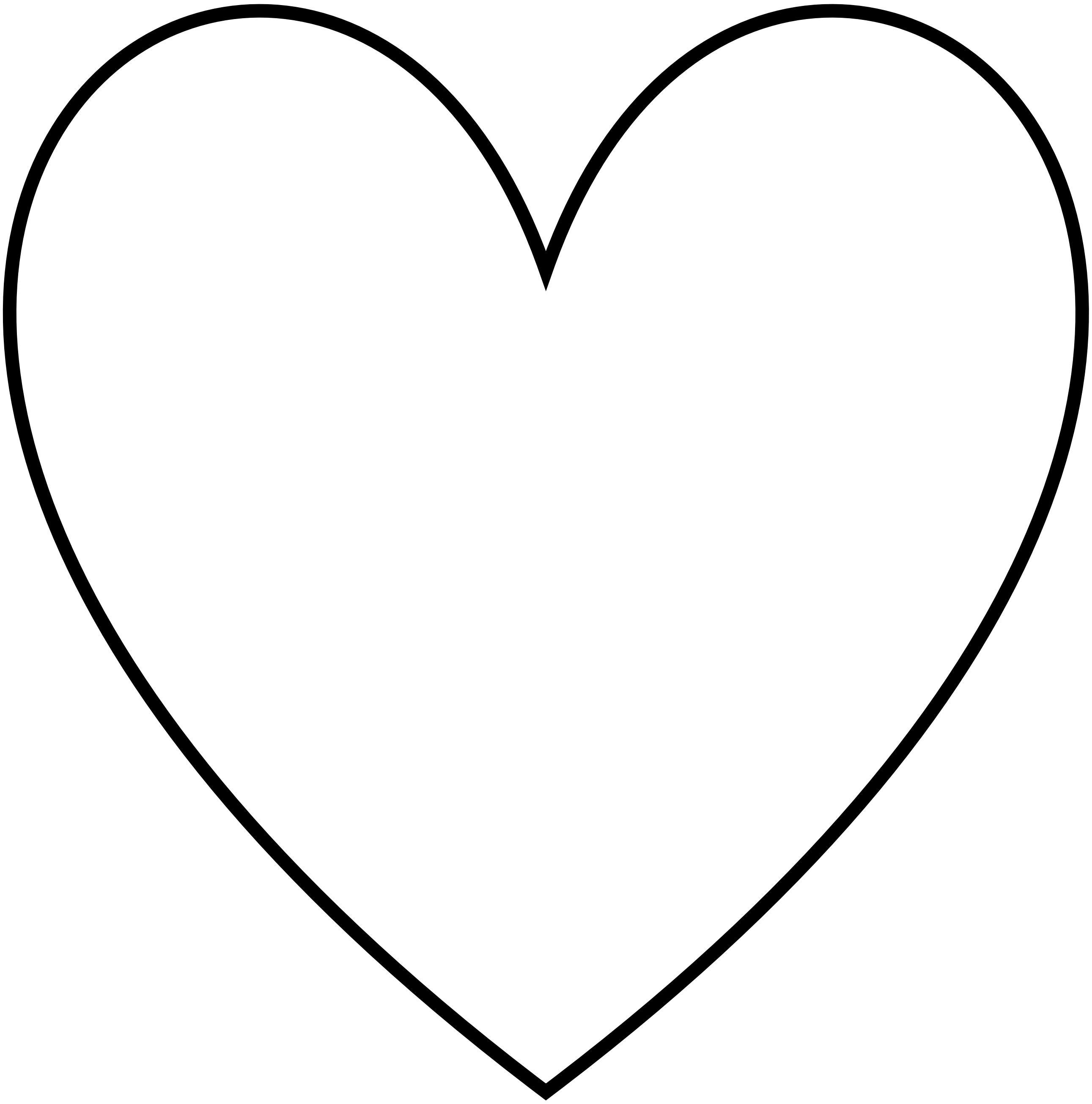
1	AET
2	PET
3	OFT-M
4	OFT-V
5	OFT-P

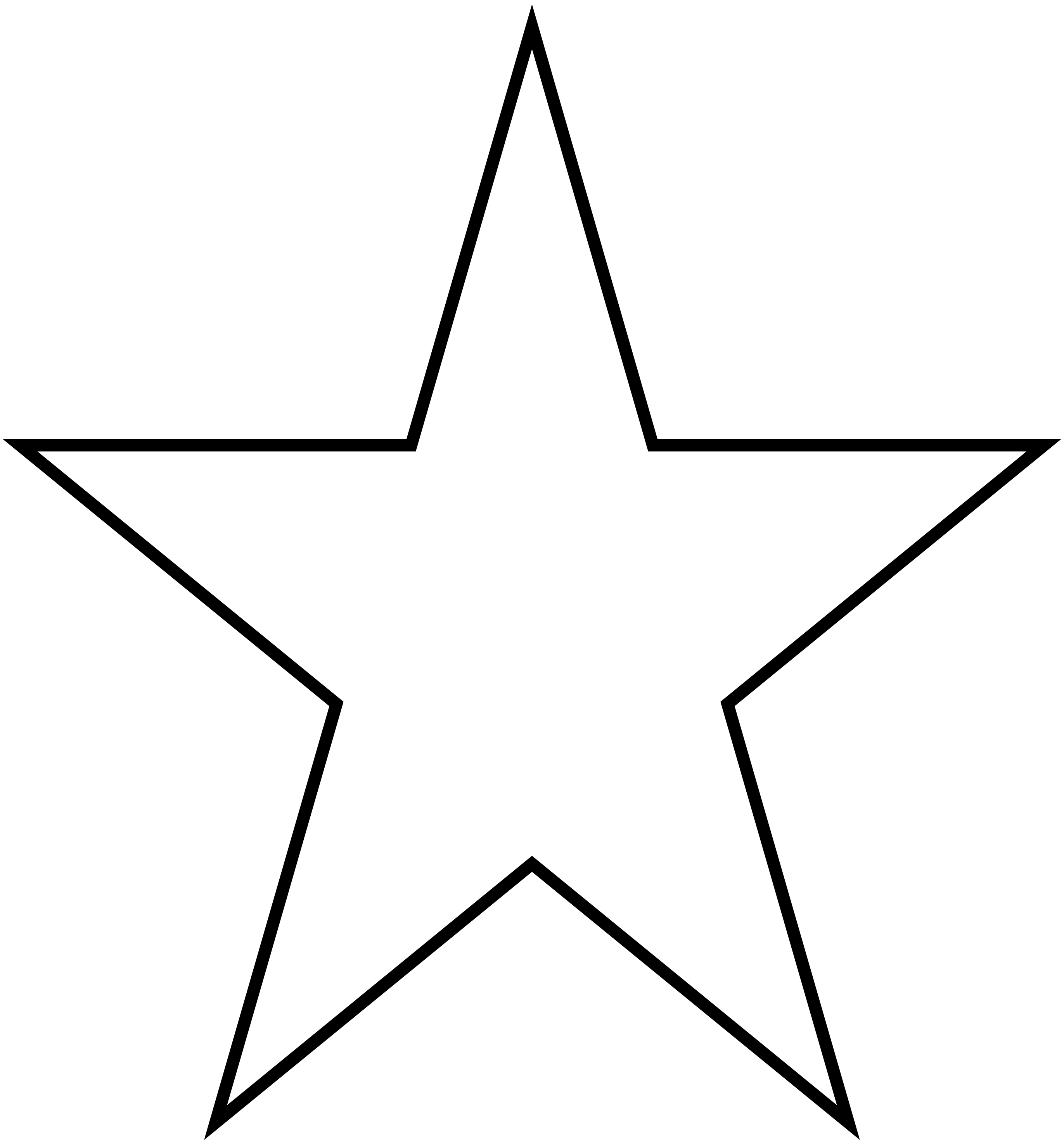
AET = Active Engagement/Participation
PET = Passive Engagement/Looking at activity
OFT-M = Off Task Motor/touching/movement not associated with the task
OFT-V = Off Task Verbal/Talking not associated with the task
OFT-P = Off Task Passive No Looking/No Movement associated with task

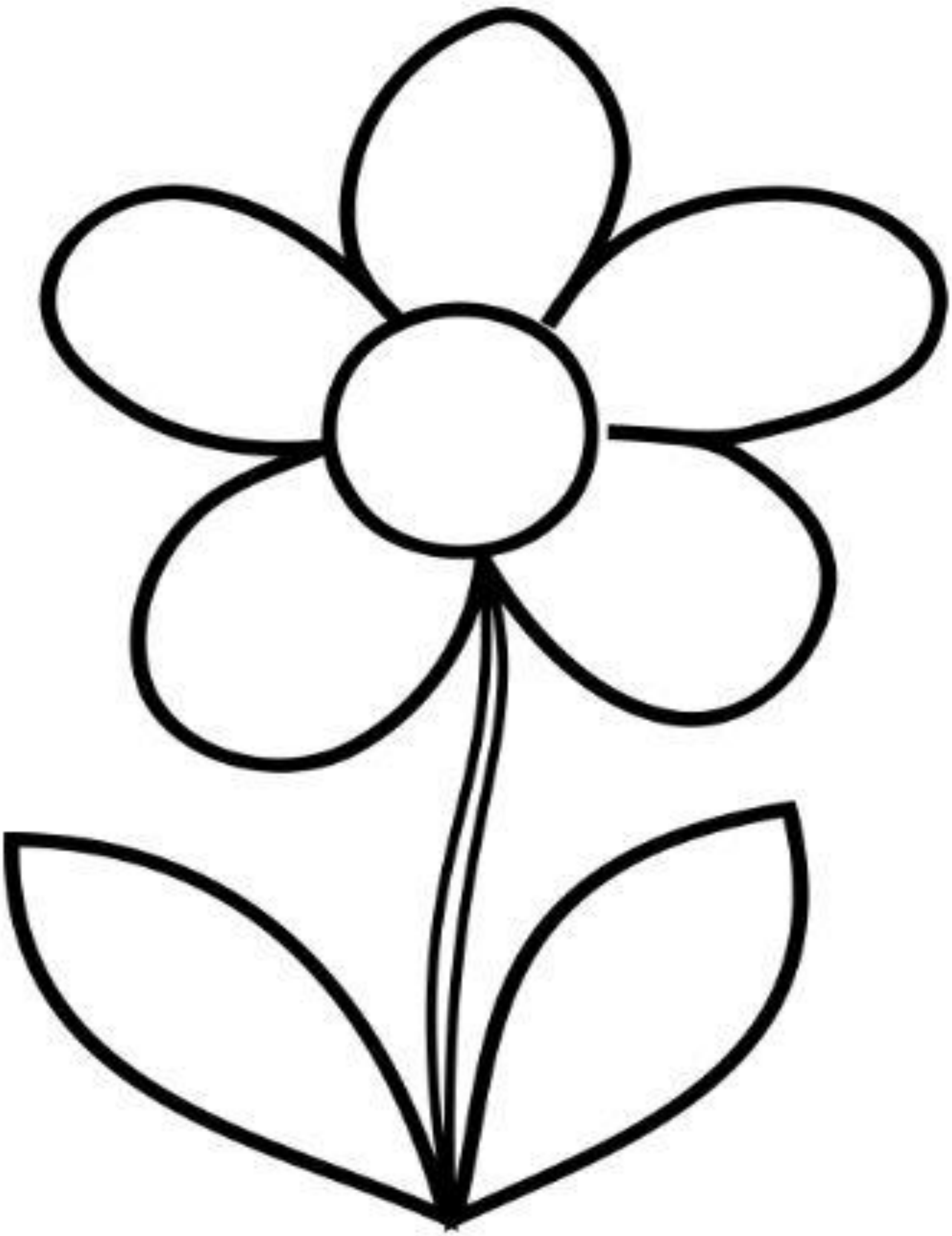
Time

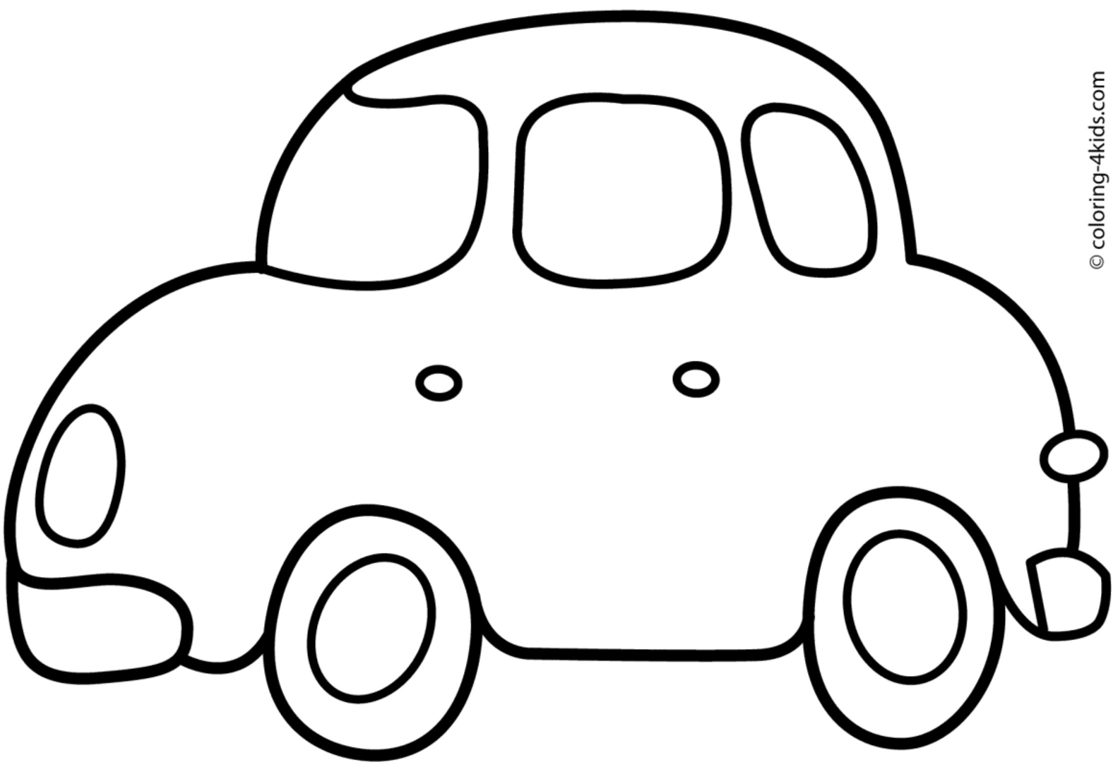
1.	16.	31.	46
2.	17.	32.	47.
3.	18.	33.	48.
4.	19.	34.	49.
5.	20.	35.	50.
6.	21.	36.	51.
7.	22.	37.	52.
8.	23.	38.	53.
9.	24.	39.	54.
10.	25.	40.	55.
11.	26.	41.	56.
12.	27.	42.	57.
13.	28.	43.	58.
14.	29.	44.	59.
15.	30.	45.	60.

Appendix I





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