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Art and Memory: An Examination of the Learning Benefits of Visual-Art Exposure

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by

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(Under the Direction of Lawrence Locker)

ABSTRACT

Past research has indicated that art education can be beneficial to students' education, possibly through beneficial effects related to learning and memory. Although some prior research has explored effects of art education for children, relatively little research has investigated beneficial effects of art in relation to adult learners. The aim of the current study was to explore whether a beneficial relationship exists between art and memory for adults in the context of an experimental study. Participants were randomly assigned to one of four conditions: Engaging in creative art, viewing art, discriminating among visually presented shapes, and writing a description of their current classes. Following each condition, participants were presented a series of words and later asked to recall the words in a cued-recall task. Results revealed that memory performance was better in the engagement in art condition relative to the other three conditions. The results of this study are discussed in the context of cognitive mechanisms related to both memory and attention.

INDEX WORDS: Art, Memory, Education, Art Exposure, Creativity, Visual Art, Art and Memory

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by

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DEDICATION

I would like to dedicate this thesis to my advisor Lawrence Locker. This thesis would have never come to fruition without his guidance.

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CHAPTER 1

INTRODUCTION

Education can often seem to be a matter of analysis of statistics and test scores. In order to gain a more personal perspective, let us consider a little boy named Oscar. Oscar is a young boy in school who is having difficulty in his studies. His teachers say that he is very disruptive and that he is not interested in his studies. The only activity that Oscar seems to be interested in doing is drawing. It is important to note that drawing is not a valued skill where Oscar is from and they do not offer any art classes in which he can express his creative interests. This frustration in Oscar's life came to a climax when he decided to skip his finals and head off to pursue his dreams. Had Oscar had a creative outlet in school, he might have been able to express his creative abilities and become a great artist. In spite of all the odds against him, Oscar did become a great artist. However, we all know him better as Oscar Claude Monet (Losiowski, 2009). Although Monet was able to overcome the odds against him, how many great artists have been lost to history because they had no creative outlets in school?

Education is one of the most important experiences in a child's life, and learning is often emphasized as a means by which to excel or achieve success. Consequently, there is substantial emphasis placed on subjects that can be assessed in standardized tests such as mathematics and English (Roher, 2005). Accordingly, when one considers important educational goals, the arts may not be perceived as a priority. Indeed, the arts may often be the first areas to be cut in times of budget crises (Deforge, 2009). However, the famous artist Jacques-Louis David argued that "To give body and perfect form to your thought, this alone is what it is to be an artist" (Artquotes.net, 2009). If people assume

that he is correct, then it is not unreasonable to say that art and thought are interconnected, and consequently art may be a critical component of education. Modern research has provided support for this claim.

In fact, surveys have found that 93% of Americans feel that the arts are vital in terms of contributing to a well-rounded education, and 86% agree that the arts improve children's attitudes toward school (Ruppert, 2006). Given these viewpoints, it is understandable if school systems stress art education as part of their curriculum. However, as noted above, this is often not the case, and art programs are often vulnerable to budget cuts (Russell, 2008). Russell (2008) noted that the federal "No Child Left Behind" law, for example, requires students to participate in the arts, yet there are no state exams for art education as there are for areas such as math or science. These findings might suggest that, although the arts appear to be valued, art education may not be emphasized in practice, as tangible educational benefits may not be apparent.

Studies do suggest that the arts are an essential part of education that can promote outcomes such as academic achievement, as well as perseverance in learning tasks (Darby, 1994). For example, children who were learning English as their second language, and involved in an art-education program, had greater gains in both mathematical achievement and their language learning than those who were not involved in an arts-education program (Finnan-Jones, 2008). Additionally, Finnan-Jones noted that the arts-education program provided numerous instances for students to apply mathematical concepts, as well as become comfortable with expressing themselves in English.

Other studies have found that the longer children are involved in visual art, the more complex their artwork becomes (Hanline & Milton, 2007). It may be the case that greater complexity of artwork reflects greater complexity of the underlying thought processes (Cherney, Seiwert, Dickey, & Flichtbeil, 2006). Yet, this argument is merely a presupposition, as there have not been a great number of empirical studies investigating art and mental processing (e.g., difficulty in defining constructs, objective measurements, etc). However studies provide some evidence of a positive relationship between art and mental processing in terms of neurological and cognitive processing.

NEUROPSYCHOLOGICAL EVIDENCE

When considering the benefits of art neurologically, it is important to also consider the issue of creativity. Research has suggested that it may be the creativity component of art that has a positive effect on learning (Runko & Sakamoto, 1999). Runko and Sakmoto suggested that creativity is related to activation of particular areas of the brain that, in turn, may be related to greater receptivity to new incoming information. Because the brain processes information more efficiently, mental processes such as memory may benefit. Nalbantian (2008), for example, proposed that creative activities link short-term and long-term memory due to how the qualities of a work of art promote long-term memories to be directed in a short-term memory activity. In other words individuals that participate in art are engaging in a short-term activity, but they must activate long-term memories in order to complete the task. While simply drawing may require only short-term or working memory mechanisms, relating the visual items to an idea, etc. requires long-term memory. We are still left with the question of exactly what areas of the brain are implicated in this process.

Various regions of the brain have been shown to be related to processing of art. For example, research has shown that creativity is generally associated with right-hemispheric activation, and that this activation can be induced by engaging in such tasks as art (Martindale, 1999). Notably, the right-hemisphere is also involved in the processing of novel and unfamiliar tasks (Martin & Shrira). This helps to establish a potential link between right-hemispheric activation, art, and the processing of new or novel information.

Another area of the brain that has been proposed as an area active in creative thought is the cerebellum (Mumford & Caughron, 2007). Vandervert, Schimpf, and Liu (2007) argued that the cerebellum formulates a model of cognitive functions that have been repetitious, and then feeds these back to the cerebral cortex. This then enhances the speed and efficiency of the cerebral cortex, a region involved in higher level functions. Mumford and Caughron have hypothesized that the cerebellum, working memory, and the prefrontal cortex might work together in creative problem solving. Notably, these authors also argue that creativity involves a strong visual component, and there has been some research indicating a link between efficient cognitive processing and visual imagery. For example, memory is enhanced when visual imagery is utilized (Beni & Moe, 2003).

Nalbantion (2008) asserts that pathways can be traced from the visual to the temporal then to the parietal areas of the brain. Within the temporal lobe the viewer recognizes familiar objects such as faces, color, objects, etc. This process leads the viewer to access long-term memory, synthesize input imagery, and access information stored in long-term memory.

Additionally, there is some evidence that visual perceptions can activate the prefrontal cortex area of the brain (Cela-Conde et. al, 2004). Frith and Dolan (1996) discussed how the prefrontal cortex is involved in higher thought processes. If visual perception and higher thought processes are both involved in activation of the prefrontal cortex, it might be possible to use visual art education to arouse frontal lobe activation, which would ideally improve cognitive processes in subjects other than art education.

Finally, studies have also found a negative correlation between verbal fluency, which is believed to be an aspect of creativity, and the brain's glucose metabolic rate (Martindale, 1999). Martindale argued that individuals who are more creative in general require less mental energy during processing. It is assumed that a high level of creative functioning does not require a great deal of neural energy to accomplish the creative task. An individual, whose creativity is not well developed, alternatively would require much more mental energy in order to accomplish the same task. Martindale, (1999) continues in discussing how creativity is associated with varying levels of cortical arousal. In their experiment involving EEG, they found that individuals who are highly creative are better at controlling their EEG alpha levels. It was concluded that creative individuals may be better at focusing their attention as a result. It might be reasonable to suggest then that creativity and art are related, because they *both boost* cortical arousal (Cupchick, 1994; Runko & Sakamoto, 1999). That is, both creative activities as well as visually engaging art both show increased cortical activation due to how they both require effortful thought. Other studies have been conducted using fMRI and working memory tasks to show that neurological performance is negatively correlated with brain activity (Nagel, Barlett, Schwensburg, & Tapert, 2005). This suggests that individuals with well developed

neuropsychological abilities require fewer neural resources in order to perform the task at hand. So, perhaps individuals who develop their creative skills would require less mental energy to engage in an artistic task. This research ties in with that of Martindale (1999) in that creative individuals are better at controlling their mental energy. That is, the cortical regions implicated in creativity and art would appear to support the idea that there are tangible processing benefits related to art. An important question then, is do processing benefits related to art generalize or benefit other processes? Although the neuropsychological evidence is somewhat indirect, there is converging cognitive evidence that suggests that this may be the case.

COGNITIVE AND EDUCATIONAL EVIDENCE

The literature described previously suggests that there may be a beneficial link between art and neurological activity. This idea is also supported by studies assessing cognitive processing and art. Studies have suggested that art programs can have a dramatic effect on elementary and high school student's performance on academic tests (Young, 2005). Young speculates that this could be due to how many art programs facilitate the acquisition of critical thinking skills that are applicable to other subject areas. Additionally, some studies have sought to demonstrate that artistic training can help to facilitate basic skills and perceptions that are shared by the sciences and as a result these skills may be transferable to other subjects (Winner, 2007). Although no direct evidence exists for transfer effects, given that both the arts and the sciences share some common skills it is possible that they could transfer. However, more research in this area is still needed. Such learned skills shared by both the arts and the sciences include observation, envisioning, reflection, expression, exploration, etc. (Winner, 2007).

Given that there are possible educational benefits, it follows that there may be cognitive benefits that can be examined. For example, Goldberg (2005) reported that third grade students who were trained in specific art tasks revealed improvements in metacognition. Metacognition is defined as the extent to which an individual is aware of his/her own thoughts and the factors that influence thinking. Goldberg found that engaging in various art tasks that encouraged metacognitive thinking allowed the students to improve their ability to apprehend thematic relations among artistic elements, develop problem solving strategies, and develop clearer solutions to problems relating to artistic rudiments.

When considering the mechanisms that might underlie a relationship between mental processing and art, the visual component must be considered. As noted above, there is a link between creativity and visualization as well as a link between visualization efficiency of cognitive processing. (Runko & Sakamoto, 1999; Martindale, 1999; Kim & Olaciregui, 2008). Art education can help students develop better aesthetic perceptions (i.e., the ability to visually perceive a particular attribute of a work of art) in addition to things such as form, color, or movement (Haanstra, 1996). Research has also shown that visual concept tasks, (i.e., tasks that incorporate visual stimuli related to the subject matter , for example, a science portfolio containing visual images of science related concepts), are more effective at increasing the speed and accuracy of students' retrieval of information than non-visual tasks (Kim & Olaciregui, 2008). In their study, Kim and Olaciregui found that not only is speed and accuracy of retrieval increased, but also long-term retention of the information. Visual tasks can also benefit our processing because it can help us understand abstract relationships between elements (Scaife & Rogers, 1996).

In addition, it has been found that visual information can help to reduce our cognitive loads or the stress regarding the context of a task (Sweller & Chandler, 1994).

Medved, Cupchik, and Oatley (2004) suggested that the visual arts may benefit cognitive functioning because of the way we process information. This could be viewed as a matter of levels of processing in which information that is processed deeply is remembered without difficulty. These authors demonstrated that individuals who integrate artwork in museums with their own autobiographical information have more accurate memories of the artwork long after seeing it. The authors also suggest that, due to the ambiguity of many works of art, the brain does not arrive at automatic conclusions about the subject matter. The viewer has to utilize other routes, or other cognitive processing skills, to interpret what is being viewed. It is possible that the extra effort required to interpret the work could strengthen these new routes being used, as well as stimulating other various parts of the mind. These two processes in conjunction might lead to better receptivity of new information.

Finally, mention should be made of the relationship between cognition and emotion. How the person feels can have an effect on their learning and their test scores (Powell, 2004). Powell examined medical students who suffered from test anxiety, and implemented a treatment plan to aid them in overcoming it. Once relaxation techniques were mastered, the students' test scores improved. Some researchers have argued that mood also plays a major role in the relationship between art and memory. It has been found that making art is a pleasurable experience and therefore improves mood either by redirection of attention or by catharsis, and that creating visual art does help to improve mood for a short period of time (Dalebroux, Goldstein, & Winner, 2008; De Petrillo &

Winner, 2005). Participation in art has also been shown to be linked to lower stress levels. (Eisen, 2007).

Pleasure related to the arts also seems to encourage people to acquire difficult skills that other subjects may demand (Gardiner et. al, 1996). For instance, Gardiner et. al (1996) found that children who were, on average, behind their classmates in certain classes were able to catch up in a relatively short amount of time when engaging in an art curriculum, as compared to those whose curriculum did not include art. Gardiner et. al (1996) suggest that it is the pleasure of engaging in the arts that encourages the acquisition of new skills. Indeed, one study found that listening to music by the artist Mozart actually enhanced subjects' spatial reasoning scores (Jones & Estell, 2007). Further, several studies have found that children who had learning disabilities, primarily with math and reading, were able to acquire these skills more quickly when engaging in a musical activity (Schuster, 1980). This, as well as the study mentioned earlier by Gardiner (1996), suggests learning disabilities can be aided by simply involving children in the arts.

The literature reviewed above supports the idea there is a positive relationship between art and cognitive processes such as memory. This idea is compatible with cognitive models of information processing and memory. Engagement in art or art analysis may be a very analytical process that requires a great deal of deep processing (Medved et. al, 2004). Craik and Lockhart's (1972) level of processing model is based on the idea that if a person processes information only at a shallow level, they will be less likely to remember it later. However, if a person processes information in a deep and meaningful way, they are far more likely to remember that information. Simply put,

deeper levels of processing lead to better memory for the information of interest. As noted, art may involve a deeper level of processing. Consequently, art may facilitate memory.

A relationship between art and memory may also be considered within the context of semantic memory (e.g., Collins & Loftus, 1975). The Collins and Loftus model assumes semantic memory is made up of a vast structure of nodes and links. Each node represents a concept and the links represent the associations or relationships between each concept. When a node is activated, it spreads activation to the surrounding nodes that are meaningfully related. This could be related back to the findings of Medved, et. al, (2004) concerning how art is often ambiguous and does not allow us to draw quick or automatic conclusions about its subject matter. Thus, it is possible that art benefits processing be necessitating a broader activation of concepts in semantic memory necessary to apprehend the artistic work. Factors such as visualization, as well as mood, may be important as well.

Although the literature reviewed above is suggestive that benefits of art engagement could generalize to cognitive processes such as memory, there has been very few, if any, controlled studies that have directly investigated the issue, particularly in adults. Therefore, the purpose of the current study was to directly investigate the relationship between visual processing, art and memory. The proposed study constitutes an extension of pilot research in which I developed a new methodology by which to begin investigating the factors that might underlie artistic benefits on cognitive processing.

CHAPTER 2

PILOT STUDY

The purpose of the pilot study was to assess the relative benefits of visual art and non artistic tasks on memory performance in adults. The experiment was designed such that groups would either engage in, or view, visual art or engage in non-art tasks. In other words, to manipulate the relative degree of creativity, while maintaining attentional engagement. It was hypothesized that, if creativity has a particular benefit on processing, engagement in art should benefit processing relative to conditions or tasks that may engage attention, but do not involve a creative component. The study was designed such that all conditions involved engagement of attention but varied in the degree of artistic engagement.

Participants were randomly assigned to one of four conditions. The first condition involved participants viewing an inkblot and producing an original work of art. This was designed to involve visual processing as well as engage in creative artistic activity. The second condition involved participants viewing a slideshow of artworks projected via PowerPoint. These images were randomly selected and included various styles of visual art (see Appendix A). This condition involved creative processing, but not actually engaging in creative activity. Each slide as presented for 30 seconds. In the third condition, participants viewed a slide show of shapes and were asked to, in some cases, determine whether the shapes were the same, and in others, identify the name of the shape. The same/different slides lasted one minute and the naming shapes slides lasted for one minute and thirty seconds. The latter was longer due to longer time required to write the name of the shape than to identify if two shapes are the same or different (see

Appendix H). This condition involved processing of visual stimuli as well as engaged attention, but did not involve art or creativity. The final condition involved participants writing a short description about their classes that they were taking at the time of the experiment. This condition served as a non-visual control in that it did engage attention, but did not involve viewing a visual stimulus. Thus, the conditions represented a manipulation of creative involvement with the latter two conditions representing visual and non-visual control conditions, respectively. Participants were randomly assigned to each of the conditions. All four conditions lasted a total of five minutes. Following the particular task, participants were presented seven word pairs, followed by a 20 second retention interval. The first word in the pairs was then used as cues in a cued recall task following the 20 second interval. The results revealed that memory performance was significantly higher in the drawing condition than the writing, shape, or viewing art conditions (See Figure 1). Demographics were collected including measures of creativity and personality. Correlation analysis revealed that the demographic variables were not significantly related to the memory performance. The results suggest that memory does benefit from engagement in a visual creative task. The current study was aimed at replicating the methodology employed in this pilot study while also further investigating what aspect of art may be underlying the effect.

CHAPTER 3

THE CURRENT STUDY

The results of the pilot study suggest that engaging in art can indeed benefit processing, as measured by a cued-recall task. In the pilot study, the aim was to vary levels of creative engagement while utilizing tasks that all engaged attention. However, there are two additional factors that should be considered. First, although the drawing condition did lead to improved performance, it could be argued that this condition also involved engagement of visual-motor processes, whereas the other conditions involved either primarily visual attention (or the writing control). To provide a stronger test of possible benefits of creative activity, the art condition, as well as the non-art condition, should include tasks that engage visual-motor activity and attention (i.e., drawing a copy of a visual stimulus). Therefore, the current study constituted a partial replication of the pilot study discussed above. However, the non-art, visual condition was modified to involve both visual and motor processing. In addition, mediating effects of mood were also examined. It was hypothesized that the results of the current study should reflect the pilot study. Enhanced memory performance should be found for artistic engagement relative to the other conditions. Alternatively, if the results can be accounted for in terms of visual-motor engagement, then memory performance would be expected to be similar in both the art and non-art drawing conditions, as both would engage active visual-motor processes.

CHAPTER 4

METHOD

PARTICIPANTS

Participants were 171 Introductory Psychology students at a southeastern university who volunteered to participate in the study for course credit. Participants were treated in accordance with the "Ethical Principals of Psychologists and Code of Conduct" (American Psychological Association, 1992)

MATERIALS AND PROCEDURE

To asses the effects of varying levels of visual art exposure on memory scores, participants were randomly assigned to one of the four conditions. The engaging in art was the same as in the pilot study. However, the shape condition was not included. Rather, participants were presented the same inkblot as in the creating art condition and asked to simply copy the shape as accurately as possible. In this way, participants were presented the same stimulus as in the art condition. These participants engaged in visual-motor activity, but the engagement was primarily non-creative in nature relative to the art condition. In this study, the viewing and tracing conditions were presented the same inkblots as the drawing condition in order to hold the stimuli constant. In this way we could better control for possible effects of the stimuli utilized. The writing condition was asked to write about their classes that they had taken their last year of high school. This was done to try to avoid any emotions from the classes that they may be currently engaged in. Thus, the four conditions were as follows: 1): The writing condition in which participants were asked to provide a short summary of the classes they took their last semester of high school as a non-visual control. 2: The viewing art condition in

which participants simply viewed inkblots (see Appendix B). 3: The creative art condition in which, based on the visual stimulus, participants produced an original work of art (See Appendix B). 4: The drawing-copy condition in which participants are asked to reproduce the visual stimulus (See Appendix B).

To assess memory, participants were presented seven randomly selected word pairs for one second each via a Power Point projection (see Appendix C). One-second presentation was established in piloting in order to avoid floor or ceiling effects in performance. One second allows the participants to process the words while minimizing rehearsal. The decision to use seven items was also based on the research that suggests that there is a seven plus or minus two items limitation in our working memory (Miller, 1956). A retention interval of 20 seconds was in this task. This time constraint was chosen based on limitations of working memory (Ashcraft, 2006). Participants were then tested using a cued-recall task in which they were presented the first word from the word pairs previously shown (see Appendix D). They were asked to fill in the word that previously appeared with the cue word. The dependent measure was the percent correctly recalled.

Following the memory task, participants completed two creativity scales. One was adapted from Gough, (1979) and the other from Dow and Mayer (2004) (see Appendix E). Each item on the first scale was assigned either a positive or a negative, and these were added up to compute a final score. The second creativity scale was scored on the percent correct. Participants were also given a scale, created by Watson, Clark, and Tellegen (1988), that measures positive and negative affect in order to assess mood (see Appendix F). An additional original survey, created by the researcher, was administered

that assesses factors such as participants' confidence in their art abilities and their level of art education (see Appendix G).

CHAPTER 5

RESULTS

A one-way, between–groups analysis of covariance (ANCOVA) was used to analyze these data. A significant effect was further analyzed using LSD comparisons ($p < 0.05$). Varying levels of art exposure did have a significant effect on participant's memory test scores, $F(3, 165) = 3.13$, $p < 0.05$, partial $\eta 2 = 0.05$. There was a significant difference in memory scores between the drawing condition ($M = 37.69$, SEM = 3.03, n = 40), and tracing condition ($M = 26.03$, $SEM = 2.69$, $n = 51$), writing condition ($M = 28.55$, $SEM = 3.27$, $n = 35$), and the viewing condition ($M = 27.81$, $SEM = 2.86$, $n = 45$) (See Figure 2). There were no differences in memory scores between the writing condition, the tracing condition, and the viewing condition ($p > 0.05$). The covariate of creativity created by Dow and Mayer (2004) was significantly related to the dependent variable of memory, $F(1, 165) = 6.47$, $p < 0.05$, partial $\eta 2 = 0.04$. The covariate of art engagement also significantly related to the dependent variable of memory, $F(1, 165) = 5.57$, $p < 0.05$, partial $\eta 2 = 0.03$. These two covariates were chosen as the only two demographic variables measures that correlated with the dependent variable. No other variables correlated with memory and therefore were not entered as covariates.

Additional correlations were examined using Pearson's correlation coefficient. Positive affect and the Dow and Gough (1979) creative personality scale were positively related, $r(170) = 0.22$, $p < 0.01$. The coefficient of determination was 0.05. Student's year in school and the extent that each person rated how important art is to them were also positively related, $r(169) = 0.25$, $p < 0.01$. The coefficient of determination was 0.06. (See Table 1).

CHAPTER 6

DISCUSSION

The purpose of this study was to further investigate the relationship between art and cognitive processing in terms of memory performance within the context of an experimental study. As discussed above, the pilot study revealed a relationship between engagement in art and memory performance. This finding was replicated in the current experiment. This result would appear to support prior research that suggests that art and creativity can lead to processing benefits. Although this pattern was observed in the pilot, it was important to further examine the possible underlying mechanisms, particularly better equating the degree of engagement in terms of both visual and motor processing. Given that the advantage for creative activity remained in the second experiment, this provides stronger support that it may be the creative act or process, rather than attentional visual processing or visual motor engagement per se that is the source of a processing benefit. Furthermore, the issue of whether the benefit of a creative act is linked to mood was examined. One possibility was that mood may be enhanced as a function of engaging in, or viewing art. However, in the present study mood did not appear to account for the present results.

The current study was intended to provide a means of better understanding the beneficial processes that may be associated with art, as well as establish a methodology for assessing this issue. The current study also lends further insight into human memory, as well as how art might best be utilized in applied settings such as education. For example, if creative art leads to a deeper level of processing, it is important to identify how art best engages attention. The present study does suggest that actual engagement in

art provides memory benefits rather than simply passive viewing art. The results of this study also suggest that it is the creative process that is critical, rather than engagement of attention per se.

In general, art education can help students develop better aesthetic perceptions, or their ability to visually perceive a particular attribute in addition to things such as form, color, or movement (Haanstra, 1996). This means that these individuals are better at understanding visual complexities of the works of art. These skills could be utilized in other classes or areas that require similar problem solving skills. A good example of how these skills could be used would be analysis of mathematical scenarios. Many of the skills that Math requires are similar to skills that are used in analyzing a work of art. The findings of the current study lend support to the possibility that artistic activity generalizes to other tasks. Perhaps one possible application of this research could be the use of visually artistic tasks for studying purposes. Students could creatively draw while studying for exams (e.g., during a break) and thereby increase the amount of information remembered.

The results of the pilot study provide evidence that improved memory was not simply a function of engaging in a visual task or a task requiring attention but did leave open the possibility that the advantage for the drawing condition was due to visual motor engagement, which could conceivably lead to deeper processing. In the second study, visual motor differences were addressed across the same stimuli. Because the visual conditions were all exposed to the same stimuli, we can conclude that it is the activity the participants engaged in having the effect. Also, the influence of mood was ruled out in this particular study. Thus, the creative component appears to be relevant, as suggested

by prior studies (e.g., Runko & Sakamoto, 1999; Martindale, 1999). These findings also relate back to the issue of levels of processing. By engaging in a highly creative act, individuals may be able to process information on a deeper level, then generalize to another task. Models of semantic memory also relate to the findings in that by relating ambiguous stimuli in a creative art task, individuals are able to establish complex links between concepts. By improving and learning to establish links between concepts, retrieval of information could possibly be enhanced.

This research also converges with neurological evidence of the positive effects of creativity on processing. As previously discussed, research has indicated that creativity is positively related to activation of various brain regions that can lead to greater receptivity of information (Runko & Sakamoto, 1999). In the context of the current study, this evidence is supported, given that the creative artistic condition displayed superior memory relative to the other conditions.

The results lend support to the idea that art should be emphasized in applied settings such as education. The present study lends insight into how art might best be utilized. The pilot study, as well as the current study, suggests engagement in art might be most effective. For example, requiring an art class in which students are taught, and engage in, painting or drawing may prove to be most beneficial.

In terms of future research, there are a number of directions that could be explored. The current study assessed memory improvements within a relatively short period. Future research may assess whether art benefits memory for longer periods or for more complex information or whether long-term engagement in art can have benefits on more applied measures (e.g. tests). Physiological arousal could be examined to provide a

deeper understanding of the neuropsychological activity implicated in this phenomenon. Brain imaging technology, for example, can provide a clearer picture of areas that are involved in creative processing and perhaps neurological links could be to areas associated with memory.

In future research, it may also be of interest to vary the complexity of the artwork to which the participants are exposed. Perhaps the visually creative aspect of the art can influence the final outcome of memory. Participants could be shown naturalistic art vs. abstract art. Participants could then draw a creative work of art basing their inspiration on the artwork shown. This combines elements from both previous experiments. In doing this, it is possible to examine if the complexity of the visual stimulus can have an affect on memory.

Some applications could also fall within the realm of clinical psychology. For example, one possible application is in regard to the elderly and the aging brain. Research has found that as people age they must devote a greater portion of their brains to working-memory tasks (Cook et al., 2007). Cook et al. argued that enhanced activation of the brain compensates for reduced neural efficiency due to aging. If visual art exposure is shown to improve memory, it may have benefits in the aging brain. By stimulating the brain with engagement, it may be possible to strengthen these neural connections and therefore help mitigate to some degree effects of the brain aging. This could possibly have a number of implications for Alzheimer's patients. It would be interesting to see what effect creative art production could have on memory performance in AD patients given their cognitive decline.

This line of research is not only relatively inexpensive but it is also vital to provide support for art programs. The youth of today are the leaders of tomorrow, and depriving them of the fullest quality education is detrimental to the future of the nation, and steps must be taken to correct it. These findings suggest that Art programs can have educational benefits and should be given a higher emphasis in school. In addition, by deemphasizing art programs, how many artists are we losing? After all, the great artist Claude Monet, who is known for leading the Impressionist movement, was nearly lost due to lack of value for art education in his time (Losiowski, 2009).

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Table 1

Summary of correlations, Means, and Standard Deviations

Measure	2	3	4	5	6	*M*	*SD*
1. Positive Affect	-0.01	0.22**	0.09	0.16*	0.07	28.43	8.14
2. Memory Score	-	0.18*	0.17*	0.05	-0.05	29.57	20.12
3. Creativity		-	0.03	0.03	0.14	35.12	19.37
4. Art Engagement			-	0.41**	0.14	3.77	2.35
5. Art is Important				-	0.25**	6.03	2.53
6. Year in School					-	1.43	0.72

**$p < 0.01$
* $p < 0.05$

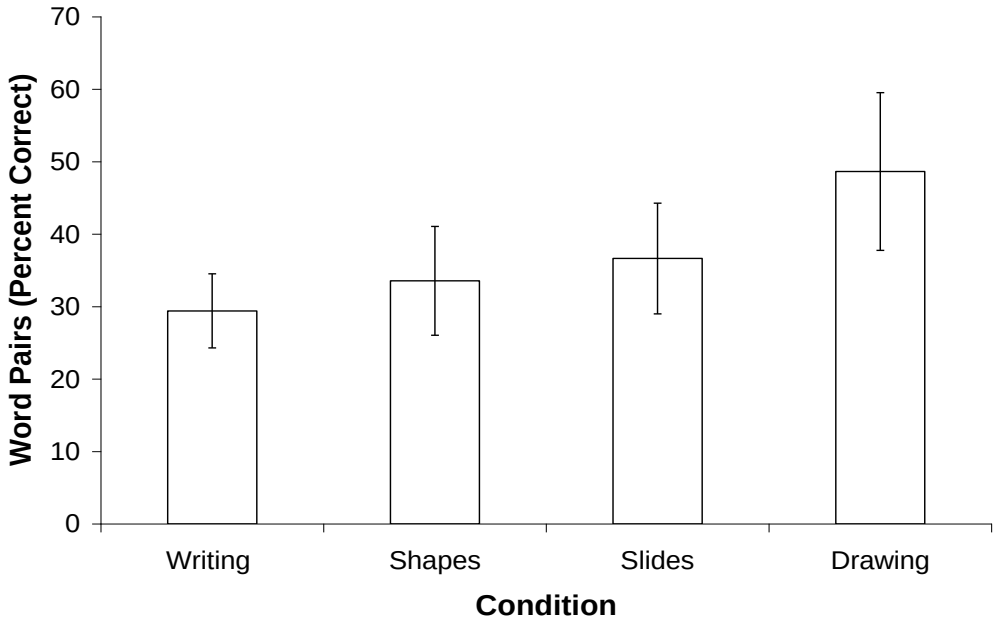


Figure 1. Mean memory scores evaluated on percent correct.

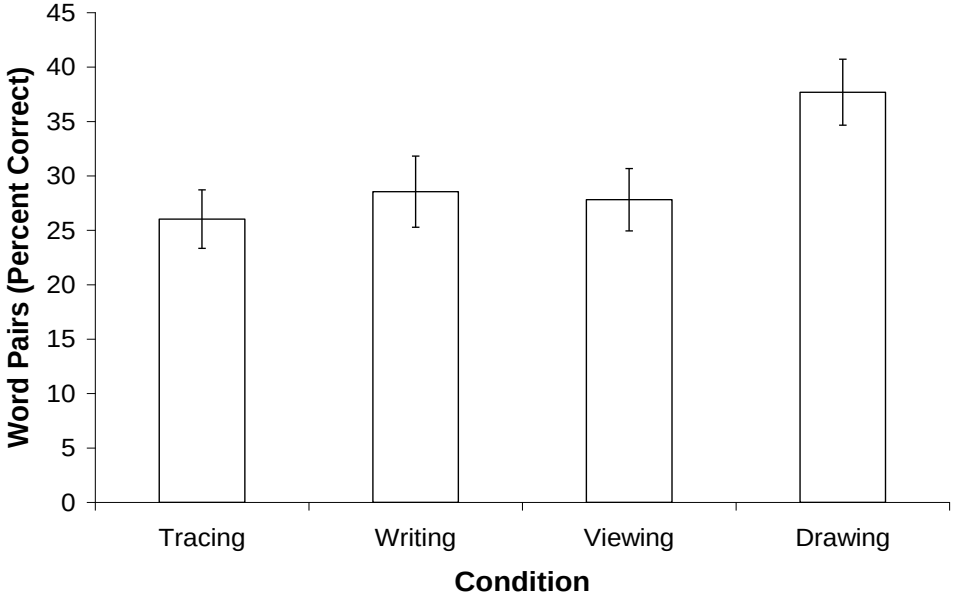
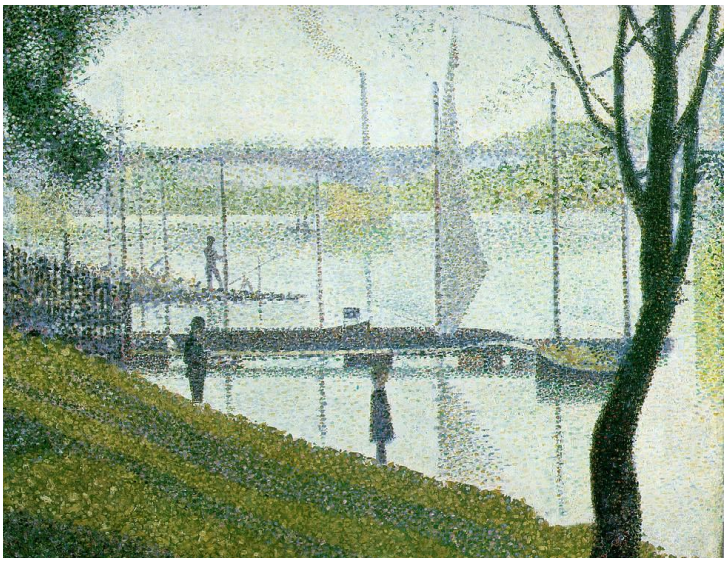
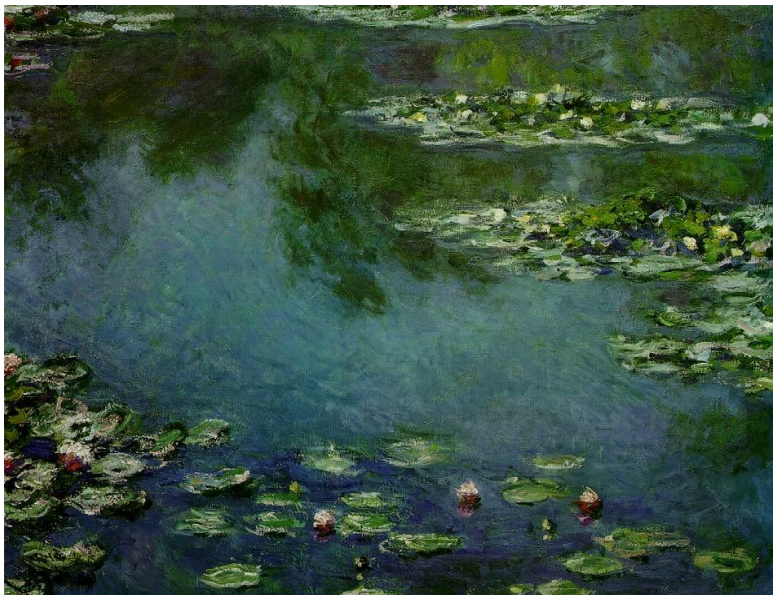
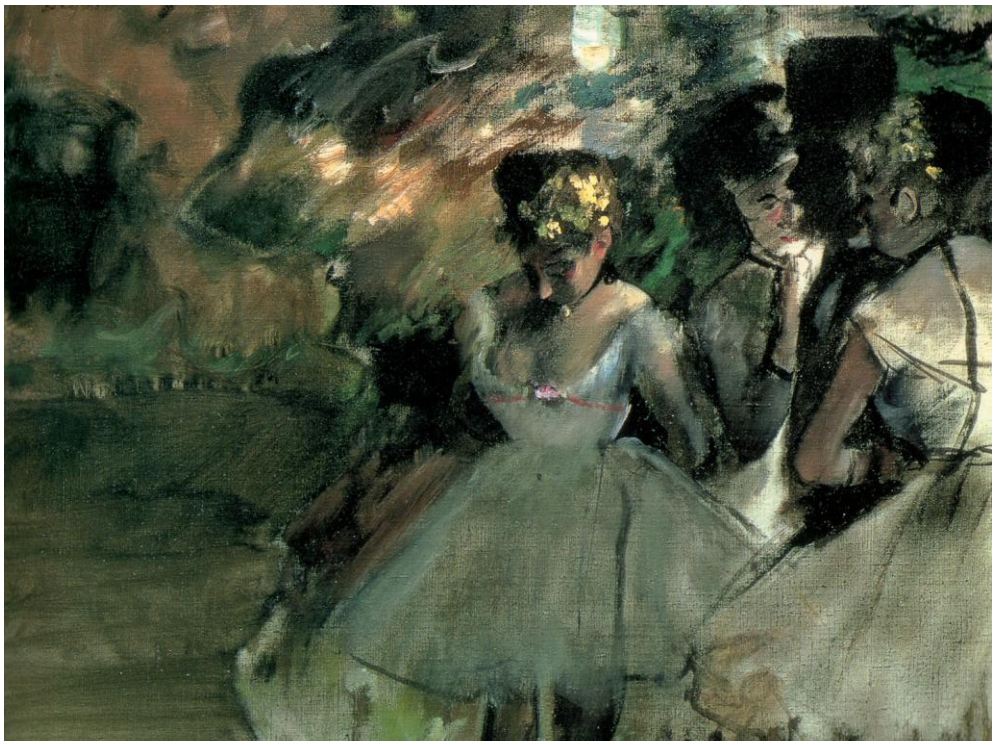


Figure 2. Mean memory scores evaluated on percent correct.

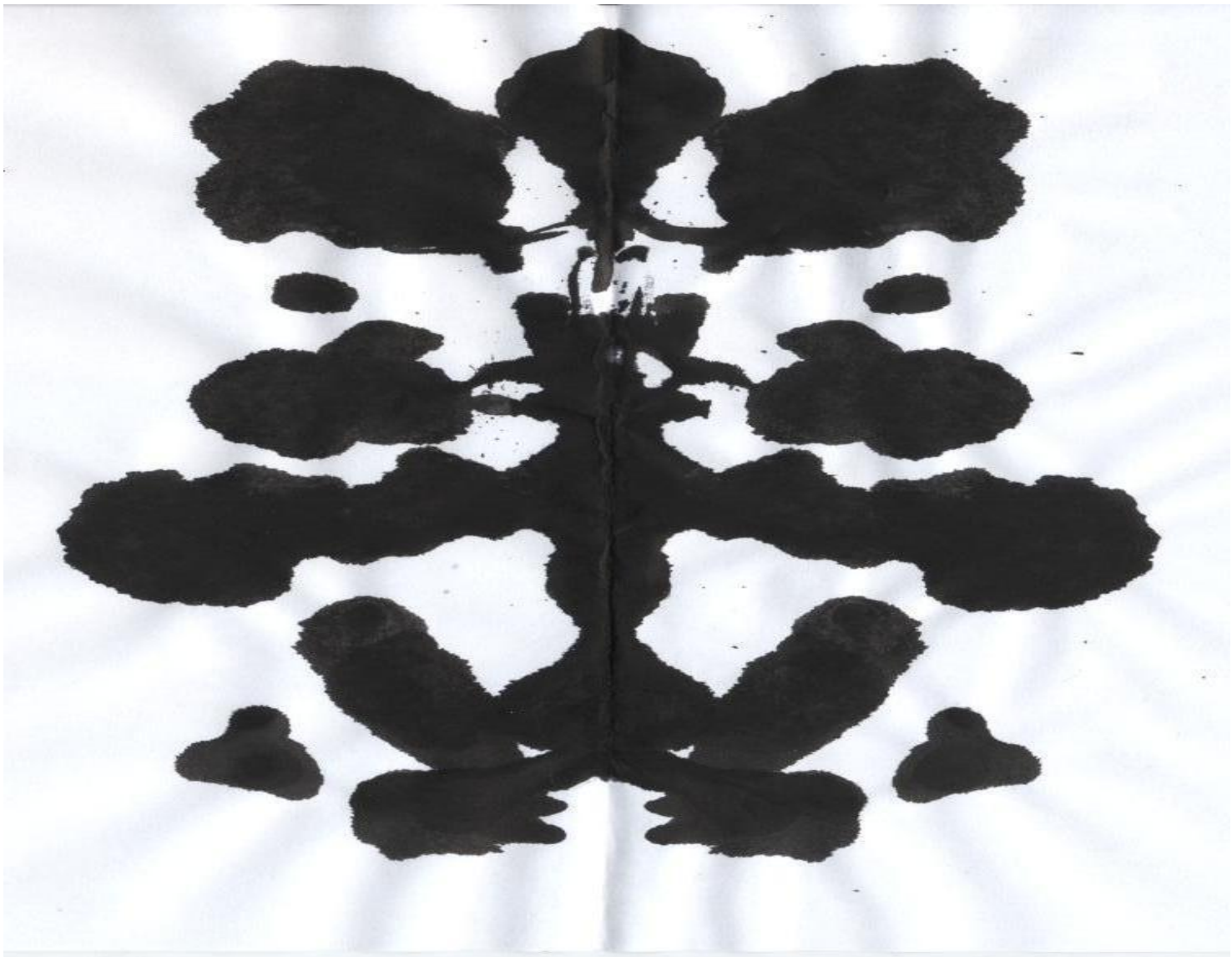
Appendix A
Art Images







Appendix B
Ink Blots



Appendix C
Word Pairs

Ant – Office

Brain – Farm

Cup – Chair

Goat – Jewel

Monkey – Orange

Potato – Screw

Doctor – Worm

Appendix D
Cued Recall Task

Please complete these words pairs according to the word pairs that were shown on the power point earlier.

1. Ant –
2. Brain –
3. Cup -
4. Goat -
5. Monkey –
6. Potato –
7. Doctor -

Appendix E
Creativity Scales

Please indicate which of the following adjectives best describe yourself.

Check all that apply.

_____ Capable	_____ Honest
_____ Artificial	_____ Intelligent
_____ Clever	_____ Well-mannered
_____ Cautious	_____ Wide interests
_____ Confident	_____ Inventive
_____ Egotistical	_____ Original
_____ Commonplace	_____ Narrow interests
_____ Humorous	_____ Reflective
_____ Conservative	_____ Sincere
_____ Individualistic	_____ Resourceful
_____ Conventional	_____ Self-confident
_____ Informal	_____ Sexy
_____ Dissatisfied	_____ Submissive
_____ Insightful	_____ Snobbish
_____ Suspicious	_____ Unconventional

Please answer the following questions to the best of your ability. If you cannot answer one, move on to the next question and go back if there is any remaining time.

1. Smith Family: In the Smith family, there are 7 sisters and each sister has 1 brother. If you count Mr. Smith, how many males are there in the Smith family?

2. Eyes: Yesterday I went to the zoo and saw the giraffes and ostriches. Altogether they had 30 eyes and 44 legs. How many animals were there?

3. Horse: A man bought a horse for $60 and sold it for $70. Then he bought it back for $80 and sold it for $90. How much did he make or lose in the horse trading business?

4. Pile: A child playing on the beach has 6 sand piles in one area and 3 in another. If he put them all together, how many sand piles would he have?

5. Widow: Is it legal for a man to marry his widow's sister? Why or why not?

6. Plums: A farmer in California owns a beautiful pear tree. He supplies the fruit to a nearby grocery store. The store owner has called the farmer to see how much fruit is available for him to purchase. The farmer knows that the main trunk has 24 branches. Each branch has exactly 6 twigs. Since each twig bears one piece of fruit, how many plums will the farmer be able to deliver?

7. Series: Identify the next term in the series:
88 ... 64 ... 24 ...

8. Triangle: The triangle shown below points to the top of the page. Show how you can move three dots to get the triangle to point to the bottom of the page.

9. Chain: A girl has four pieces of chain. Each piece is made up of three links. She wants to join the pieces into a single closed loop of chain (like a necklace). To open a link costs 2 cents and to close a link costs 3 cents. She only has 15 cents. How does she do it?

Appendix F
Mood Scale

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way today. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested
_____ distressed
_____ excited
_____ upset
_____ strong
_____ guilty
_____ scared
_____ hostile
_____ enthusiastic
_____ proud

_____ irritable
_____ alert
_____ ashamed
_____ inspired
_____ nervous
_____ determined
_____ attentive
_____ jittery
_____ active
_____ afraid

Appendix G
Art Demographics

1) How skilled do you consider yourself in art?

Not Skilled At All									Very Skilled
1	2	3	4	5	6	7	8	9	10

2) How often do you engage in any artful activity?

Very Seldom									Very Often
1	2	3	4	5	6	7	8	9	10

3) How highly would you rank your level of art education?

Not Highly At All									Very Highly
1	2	3	4	5	6	7	8	9	10

4) How much do you enjoy engaging in art?

Do Not Enjoy it At All									Strongly Enjoy it
1	2	3	4	5	6	7	8	9	10

5) How much experience have you had in art?

Not Much At All									Very Experienced
1	2	3	4	5	6	7	8	9	10

6) Would strongly do you agree that art is an important component in education?

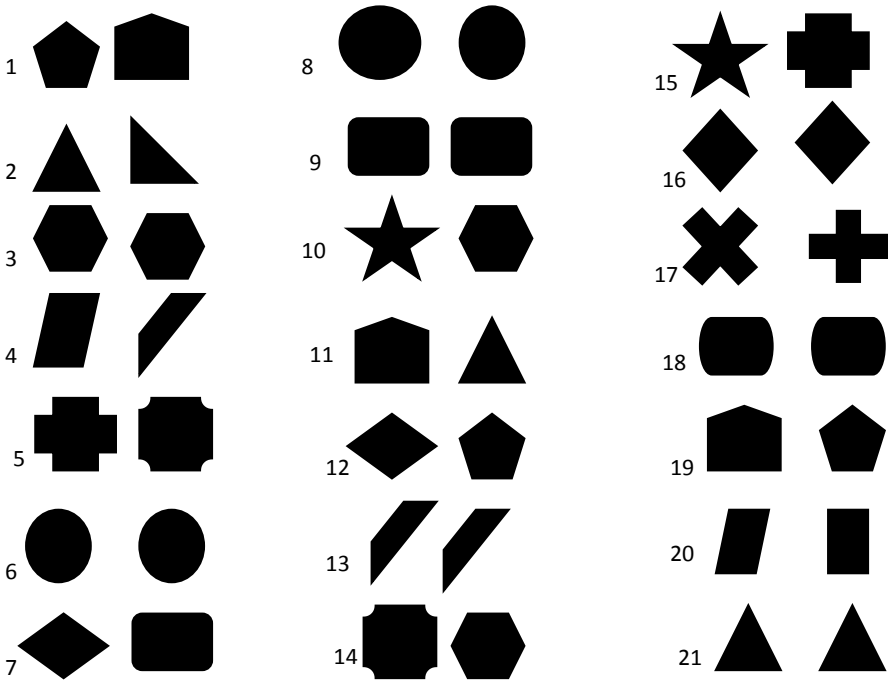
Not Strongly At All									Very Strongly
1	2	3	4	5	6	7	8	9	10

7) How much would you say that art has helped you?

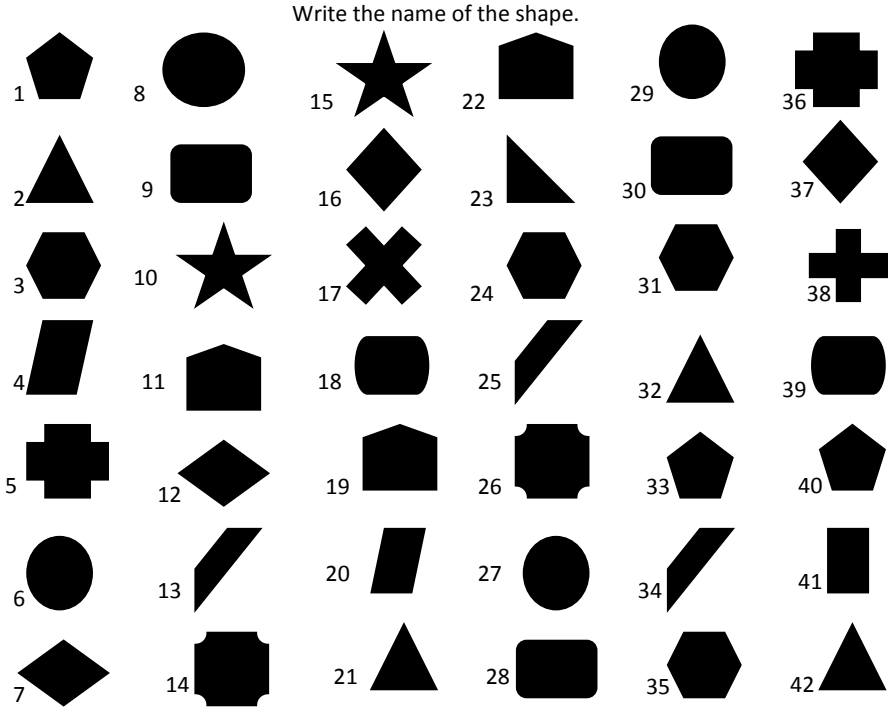
Not Much At All									Very Much
1	2	3	4	5	6	7	8	9	10

Appendix H
Geometric Shapes

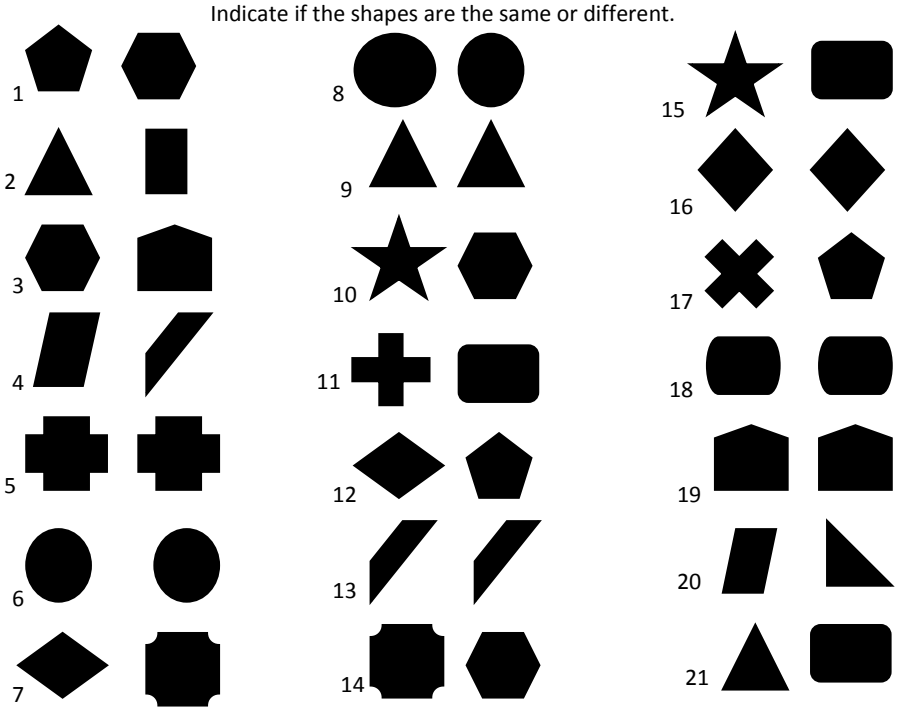
Indicate if the shapes are the same or different.



Write the name of the shape.



Indicate if the shapes are the same or different.



Write the name of the shape.