

Art Therapy's Effectiveness and its Role in Treating Neurological Conditions

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October 14, 2023

Abstract

This paper explores the extensive psychological and neurological effects of art therapy. Additionally, it offers art therapy as a form of treatment for individuals suffering from PTSD and Alzheimer's disease. Both of these conditions pose unique dangers; PTSD patients suffer from psychological trauma and Alzheimer's patients suffer from degenerative activity in the brain. A major factor that reinforces art therapy's credibility is its ability to express nonverbal memories and emotions associated with them. Additionally, certain parts of the brain during art therapy are activated which can prove useful in PTSD and Alzheimer's. This paper considers the mechanisms and processes of art therapy along with its effects to emphasize its potential in treating symptoms and improving overall well-being.

1 Introduction

After Frida Kahlo was in a full-body cast for three months due to a debilitating bus accident, she resorted to art to pass the time and alleviate the pain. Once she physically recovered, Kahlo completed many paintings that reflected her traumatic experience. She said, "My painting carries with it the message of pain" (Svoboda, 2022). Frida Kahlo is just one example of many other people who have utilized the strength of art therapy in treating certain neurological conditions and improving well-being.

Art therapy is a type of therapy that uses creative methods of expression with the guidance of an art therapist. There are many types of art therapy, but I will be focusing on visual arts therapy such as painting and drawing. Art therapy has certain psychological effects on patients, such as strengthening a mind-body connection and improving well-being. Art-making also activates the hippocampus, amygdala, visual cortex, and prefrontal cortex during the creative process which can help treat certain neurological conditions such as PTSD and Alzheimer's.

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In this paper, I will refer to specific neurological conditions to demonstrate the positive psychological and neurological effects of art therapy. Different types of neurological conditions, ranging from strokes to Alzheimer’s disease, affect up to one billion people worldwide. An estimated 6.8 million people die every year as a result of these neurological disorders. I focus especially on art therapy’s effect on PTSD and Alzheimer’s disease, but I make references to other neurological conditions as well.

Overall, art therapy is an effective method used to combat neurological disorders including PTSD and Alzheimer’s. What makes art therapy effective are the psychological and neurological changes that take place in an individual during art therapy. Psychological changes include the expression of emotions, improved mood, and more. Neurological changes include changes to the neural connections, the prefrontal cortex, and more. Overall, the combination of these various psychological and neurological changes that occur justifies the success of the emerging field of art therapy.

2 What is Art Therapy?

The use of art therapy dates back to the 1940s when Margaret Naumburg discovered a connection between creativity and healing (Cuellar, n.d.). Since then, art therapy has been a type of psychotherapy (treatment of conditions through interaction and verbal communication) that uses various methods to encourage self-expression and aid in clinical diagnosis (Art Therapy Definition - Google Search, n.d.). At the end of the process, the goal of art therapy is to improve self-esteem and self-expression. Self-esteem can lead to better social relationships, success, and improved mental and physical health (Blouin, 2022). Similarly, self-expression allows patients to understand themselves and process emotions, leading to improved mood, behavior, and cognition (The Power of Self-Expression, 2022).

Different mediums and environments can encourage artistic expression. Common media used with artistic expression include painting, drawing, photography, and clay sculpting (Hu et al., 2021). Other forms of artistic expression, such as music therapy, dance therapy, and drama therapy exist as well, but they will be less emphasized throughout this paper. Once the patient chooses or is recommended a medium, patients either have the choice to work one-on-one with an art therapist, which provides a more intimate connection, or in a group environment, which creates a community of people similar to one another. In either environment, once the art-making process is complete, the artwork is verbally interpreted by the patient to explain what they have depicted as their emotions (with the support and guidance of their art therapist) (Longe, 2016).

There are many techniques that art therapists utilize when working with a patient, each for different purposes. Examples of some techniques include blind drawing, memory painting, emotion drawing, and self-portraits, which all aim to express the patients’ abstract feelings that can be challenging to convert into words (Hu et al., 2021). Similarly, “Bilateral Art”, is another technique

that integrates verbal and nonverbal processes by involving both left and right hemisphere functions. This technique designed by McNamee (2004) is done by using both hands in an effort to stimulate memories and experiences that are contained in both sides of the brain (Talwar, 2007).

2.1 Art Therapy vs Art as Therapy

This paper will focus on art therapy, but it is important to distinguish art therapy from art as therapy. Art therapy is a guided session with an art therapist, and the main purpose of the session is to complete certain activities that help to cope with specific situations or conditions. On the other hand, art as therapy can be considered a relaxing, everyday activity that is inadvertently therapeutic. In other words, the main goal of art as therapy is not to target or improve certain feelings, but it is a stress-relieving activity that may create a by-product of satisfying outcomes, similar to reading a book or taking a walk (Resources, 2018).

3 Psychological Effects of Art Therapy

In terms of psychology, art therapy strives to express, interpret, and examine hidden feelings without relying on only verbal communication from the patient. In one study, a patient diagnosed with dementia who could not communicate through words could only effectively communicate through drawings, therefore accessing his/her abstract cognition (Zaidel, 2005). In a different study, Dr. Meekums examined women who were survivors of childhood sexual abuse who were unable to articulate painful memories and experiences. The groups used a variety of creative art therapies (CATs) and some verbal interventions, all of which were facilitated by qualified art therapists. Dr. Meekums found that art as a form of communication and expression provided an effective alternative to normal conversation. For example, a patient stated, “I can express myself . . . I couldn’t do it when I was a child when I was being hurt. . .” (Meekums, 1999, p. 256).

Art as a way of communicating compared to verbal communication can also provide easier access to emotions. According to Czamanski-Cohen & Weihs (2016), emotions are gained through a process that combines interoceptive stimuli produced within the body or somatosensory stimuli perceived through touch, pain, temperature, and other external factors. This information is then translated to give emotional meaning. In terms of art therapy, it is the engagement with the physical art materials (somatosensory) along with the visual imagery when viewing artwork (interoceptive) that can assist in revealing emotions. When a patient touches or manipulates art materials, there are sensory responses to pressure, vibration, and temperature. These responses due to sensations in the joints, muscles, and skin while manipulating an object guide the individual in understanding the object’s qualities - such as size, shape, and weight (Czamanski-Cohen & Weihs, 2016). According to the Singer-Schachter

Two-factor Theory of Emotions, once a person feels or experiences physiological arousal, they then interpret the arousal to label it as an emotion (Yarwood, n.d.). From a more neurological standpoint, sensory information is received by the somatosensory primary cortex in the cerebral cortex. It is then transferred to the amygdala, where the information is processed into emotions. Therefore, the sensory information received during art therapy can lead to better access and acknowledgment of previously blocked emotions (Czamanski-Cohen & Weihs, 2016).

Images produced during art therapy not only retrieve but also improve emotions and attitudes. According to Holmes, Mathews, Dalgleish, and Mackintosh's (2006) hypothesis, images have the power to increase ratings of emotions and can have a more positive effect than verbal processing. To support this hypothesis, the researchers conducted a study with participants in which they were presented with numerous scenarios with initial ambiguity as to a positive outcome or not. The participants were then asked to either imagine these events or listen to the same descriptions while thinking about their meaning. The events were in paragraph form, and the first half of the paragraph began with a sentence that had a negative connotation. For example, a beginning may be "You are at home alone watching TV. You were dozing and suddenly woke up under the impression that you heard a frightening noise and then realize...". The rest of the sentence is completed by both groups. Researchers found that the participants in the imagery group reported more positive effects of the scenarios and rated the descriptions as being more positive than their counterparts. For example, a positive ending was "and then realize with relief that it was your partner returning home." This may have occurred due to participants in the verbal condition focusing more on the negative components of the paragraphs (Holmes et al., 2006). So, images produced during art therapy may affect and result in positive attitudes and emotions.

Visual communication (patient expression through artwork and images) also has a greater effect on the patient's memories and helps retrieve them, as evidenced by the picture superiority effect. According to Paivio's study in 1973 which explored the effect of pictures vs words on memory, participants were presented with pairs of words, pairs of pictures, or pairs of one word and one picture. Then, participants were tested on their memory for the previously presented stimuli. Results showed that there was better memory recall for the pairs with pictures than those with words alone. According to Paivio's "dual coding" theory, images hold more power than words because pictures generate a visual and verbal response, whereas words are not as likely to generate images for the participant (Paivio & Csapo, 1973). In any type of therapy, accessing memories is important to express previous experiences. As shown in Paivio's study, since pictures have proved useful for accessing memories, the pictures produced during art therapy can facilitate a better expressive experience for the patient.

Another example of the picture superiority effect is when patients with Alzheimer's disease were unable to recall memories of loved ones when hearing their names but were able to recognize them when presented with a picture (Ally et al., 2009). In the same study, healthy adults (controls), patients diag-

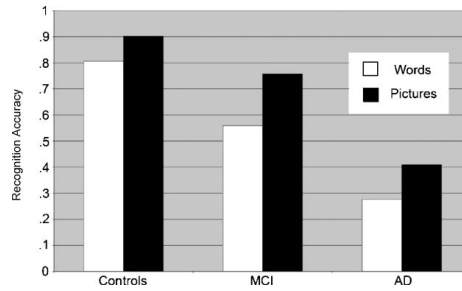


Figure 1: Picture Superiority Effect Study

nosed with MCI (mild cognitive impairment that results in memory and thinking problems due to old age), and patients diagnosed with mild Alzheimer's disease were assessed to measure memory for pictures versus words. In each case, pictures held a higher recognition accuracy, meaning that patients could recall pictures more accurately when presented with stimuli. So, this confirms the picture superiority effect (Ally et al., 2009). From these results, the use of pictures as communication and treatment in the field of art therapy can be crucial, especially in trauma and dementia patients due to the patient's ability to recall certain memories through art.

Although images produced during the art-making phase are important, combining this with an examination of the artwork for any hidden emotions or messages can strengthen a mind-body connection (Cuellar, 2007). The mind-body connection is a concept that suggests that processes of the mind, such as thinking and feeling, are rooted in one's sensory and motor experiences. Art utilizes this connection as art-making itself is sensory (it induces body sensations and emotions), and then interpreting artwork requires thinking and emotions (Czamanski-Cohen & Weihs, 2016). Numerous studies provide evidence for the mind-body connection, one of them focusing on the reduction of cortisol levels and its connection to participants' responses following visual art making. The

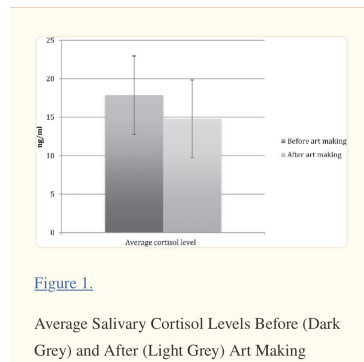


Figure 2: Cortisol Levels Before and After Art Making

“mind” in this case is the response after the process, and the “body” is the cortisol level of the participants. Cortisol is most commonly known as the body’s stress hormone. In the study, 39 participants provided saliva samples to determine cortisol levels before and after making art. During the art-making process, participants had artistic liberty and were not confined to a specific subject or material. At the end of the session, participants provided written responses about their experiences and provided another saliva sample. As shown by the graph, average cortisol levels after art-making were significantly lower than before art-making. This result matched the participants’ written responses, as most stated they felt relaxed, relieved, excited, and fulfilled. The mind-body connection shown in this study confirms that art therapy affects attitude, well-being, and emotions (mind) which can have an impact on health (body) and vice-versa (Kaimal, Ray, & Muniz, 2016).

Additionally, colors play a large role in identifying the patient’s mood and mental health, and they also transform the patient’s therapeutic experience. In multiple studies, different people with varying emotional states interacted with color in different ways. In one study, Wadeson (1971) noticed that people diagnosed with depression used significantly less color in their paintings than other patients. In another study involving a leukemic girl, the sick patient who was not feeling well used much red and black, which indicated an overflow of negative feelings. That patient died six months later (Cotton, 1985). From these studies, color has the power to reflect the mental status of the patients.



Art work done by sexual abuse survivor “Maxine” when asked to draw how she feels emotionally on a daily basis (The Palmeira Practice, 2018).

Graham (1998) proposes a chemical explanation for a patient’s use of dark and light colors based on melatonin and serotonin levels in the body. During the day, when there is typically much sunlight and colors, the hypothalamus releases the stimulant serotonin. On the other hand, at night when there are tones of gray and black, the hypothalamus releases a depressant called melatonin to help induce sleep. So, bright colors can be associated with liveliness and wakefulness, while darker colors represent gloom and feelings of melancholy (Graham, 1998). Color can also reveal personality types, as extroverts tend to gravitate towards warm and bold colors such as red and orange. Extroverts find these colors highly stimulating, while introverts prefer calmer and cooler colors such as blue and green (Birren, 1980). Warmer colors as stimulation are shown in the study by Emery (1929), where they studied patients in psychiatric wards. The patients

had previously been deprived of the color red (which was believed to induce madness), but then they received a small red string. The results showed that the patients became more animated and as a result increased their activity and work output (Emery, 1929). From these results, the color that the patient utilizes is not only a form of expression but can lead to changes in their mood and behavior as well.

However, there can be many explanations for color depending on the patient. In one study, a 31-year-old suicidal woman was asked to draw something and provide an explanation of the meaning of the colors. For red specifically, she stated that she felt strength, power, courage, and joy (Lev-Wiesel, n.d.). In another study also examining the color red, an experiment was done to draw connections between dominance (male dominance and testosterone levels) and the color red. In this experiment, red was hypothesized to signify dominance, and blue was hypothesized to signify relaxation. Participants were presented with different words, some words' meanings related to dominance, and some words' meanings related to tranquility. These different words were then changed into a blue or red font, and participants were asked to classify these words as dominance-related or rest-related while being timed. Results showed that participants made fewer errors when categorizing red dominance-related words in the dominance category rather than categorizing blue dominance-related words in the dominance category (Mentzel et al., 2017). From this experiment as well as the study of the 31-year-old woman, there is some overlap with the color red's meaning (as power, strength, and dominance), but there are individual experiences that may lead to certain colors having different meanings for everyone (shown by red's meaning as courage and joy for the woman). These colors give the patient the opportunity to express moods and emotions that they cannot express verbally. Therefore, once an art piece is complete with certain colors, and the patient feels an initial sense of self-expression, an explanation about the whole artwork may come more easily. This explanation along with the use of colors makes the art therapy session more unique for the patient, as they are able to give their own, personal explanation for the colors based on their individual experiences.

4 Neurological Effects of Art Therapy

There are many notable parts of the brain that are activated during art making, the most well-known being the hippocampus, amygdala (mentioned previously), visual cortex, and prefrontal cortex. The visual cortex, as its name suggests, receives and processes visual information to send to other regions of the brain to be analyzed, and will not require additional explanation in this paper. Also, there are many other parts of the brain that relate to the physical touch aspect of art materials, but discussing them is beyond the scope of this article. So, I will be discussing the role of the hippocampus and prefrontal cortex in this section.

4.1 The Hippocampus

Art therapy activates the hippocampus during the creative process. In a 2013 study, researchers examined the effect of hippocampal amnesia (due to lesions) on creative thinking. This is relevant to art therapy’s effect on the hippocampus because art therapy requires a great deal of creative thinking. In the study, the participants (those with normal and damaged hippocampi) completed the Torrance Tests of Creative Thinking (TTCT). In these tests, they were required to complete both the verbal and figural parts of the experiment that tested creative thinking. In the verbal form, they were given many prompts that forced them to creatively problem-solve. Prompts included “Generate ways to improve a toy so that it is more fun to play with,” “Generate alternative uses for a common object (ex) cardboard box),” and “Generate hypotheses about potential benefits or problems related to an improbable situation (ex) if clouds had strings attached to them).” Next, in the figural form, participants were to complete a drawing when given one that was incomplete. Examples include ten incomplete line contours and 30 repeated parallel line segments. Once they completed their work, the participants were asked to give their artwork a unique title. After both sections were complete, the researchers scored and examined each participant’s answers. Scores were dependent upon the fluency of their answers and originality. In the verbal section, participants with hippocampal amnesia (the study refers to them as the AM group) scored significantly lower than their healthy counterparts. For example, when asked to think of creative uses for cardboard boxes, one healthy participant came up with 26 uses, 23 of which were unique (e.g. Building a suit of armor). On the other hand, one amnesic participant came up with only 2 uses which were recycling the boxes and making a fort (Duff et al., 2013).

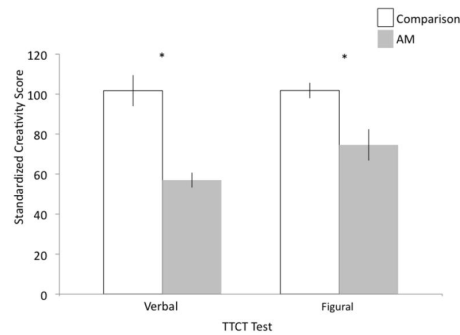


Figure 3: Creativity scores for people with hippocampal amnesia vs controls

In the figural section, the healthy participants also scored higher than the AM group. The prompt was to create an image that includes the shape of the large black oval and add new ideas surrounding it to make the picture tell an exciting story. For example, when given an incomplete drawing of a large black oval, one healthy participant turned it into a drawing of a golf course complete

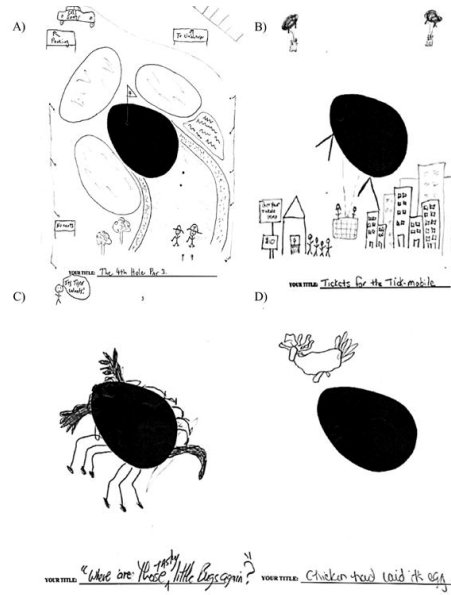


Figure 4: Drawing prompts

with signs for parking, a clubhouse, Tiger Woods, and more. Another healthy participant turned the oval into a hot air balloon that takes people for rides above the city. On the other hand, a participant from the AM group turned the oval into a bug. Another participant from the AM group used the shape as an egg and drew a chicken above it (Duff et al., 2013). This study showed that the hippocampus is extremely important in the creative process, which means that it can be activated during creativity in art therapy.

Another study that demonstrates the activation of the hippocampus in art therapy is when King & Kaimal (2019) measured brain activity through electroencephalography (EEG), a non-invasive method that allows for free movement. In one study involving EEG, patients worked with clay and drawing, and there was activation in brain regions involved in memory processing and meditative states (including the hippocampus) (King & Kaimal, 2019). Although there is little evidence for direct causation, it is possible that there may be some correlational relationship between the activation of the hippocampus and easier access to memories and emotions during the creative process.

4.2 The Prefrontal Cortex

The prefrontal cortex is highly activated during art therapy. The prefrontal cortex is important because it regulates our thoughts, emotions, and actions through connections with other regions, such as the regions stated above (Arnsten, 2009). Bogousslavsky (2005) argues that the brain's frontal anterior sub-cortical loops are activated during art-making; in other words, there is increased

neural activity in the frontal lobe during the execution of artwork (Talwar, 2007). Similarly, in an experiment involving patients coloring, doodling, and free-drawing, fNIRS scans (functional near-infrared spectroscopy that measures brain activity) showed significant activation of the medial prefrontal cortex (Kaimal et al., 2017). In another study by Zeki (2011), participants underwent brain scans while being shown images of paintings. When participants viewed paintings that they deemed beautiful, fMRI scans showed that blood flow increased by almost 10 percent to the medial orbitofrontal cortex region of the brain, a part of the prefrontal cortex associated with pleasure. The increased amount of blood flow to the medial orbitofrontal cortex is similar when looking at a loved one (ACRM, 2020). This activation of the prefrontal cortex is essential in stimulating the reward center of the brain which contributes to feelings of accomplishment (Chau et al., 2018). In patients with neurological conditions, these feelings of accomplishment and purpose due to the activation of the prefrontal cortex prove vital in recovery.

The activation of the prefrontal cortex (PFC) during art therapy also contributes to the lateralization and stimulation of both hemispheres of the brain. Although the PFC itself does not directly make the connections, the corpus callosum is a bundle of nerve fibers that facilitates communication between both hemispheres of the brain by connecting the two separate prefrontal cortices (Corpus Callosum - an Overview — ScienceDirect Topics, n.d.). The left hemisphere is associated with language, speech, analytical thinking, and sequential processing. The right hemisphere is associated with visual motor activities, intuition, emotions, and sensory skills. The integration of both hemispheres of the brain is essential for different cognitive processes including attention, decision-making, and emotional regulation. For neurological conditions (such as PTSD), these cognitive processes from lateralization can prove useful if they are strengthened through art therapy, as will be discussed later. Art therapy can promote bilateral stimulation through a technique in which the patient utilizes both dominant and non-dominant hands in the art-making process. This technique works in lateralization because the right hand is controlled by the left hemisphere of the brain, and vice versa (Malchiodi, 2003).

Both hemispheres can also be stimulated by the two-part process of art therapy. The first part is the art-making and the second part is the explanation of the artwork. The left hemisphere allows for an explanation of the image produced by (mostly) the right hemisphere from the first step (Talwar, 2007). As stated above, the connection between both hemispheres in art therapy is important for attention, decision-making, and emotional regulation. When this connection is not present, there can be dire consequences for a patient who is already struggling with a neurological condition.

The negative consequences of having no connection between the right and left hemispheres of the brain can be seen, in one case, from the agenesis of the corpus callosum (AgCC). This disorder presents itself at birth when the tissue that connects the left and right sides of the brain is partially or completely missing. The purpose of highlighting this extreme example is to show the effects of having no connection between both hemispheres in the brain to help

demonstrate why lateralization is important. In a study conducted by Labadi & Beke (2017), participants included 18 children between the ages of 6 and 8 with agenesis of the corpus callosum and 18 typically developing children who were matched by IQ, age, gender, and education. Labadi & Beke examined both groups' emotional and mental state recognition with a process that is called the "Faces Test". Each child was shown 20 photographs of an actress posing: 10 photos of basic emotions and 10 photos of complex mental states. Under each photo, two words were typed, but only one described the emotion or mental state the actress was depicting. The experimenter read the two words, and the child was asked to choose the words that best represented the actress's emotion or mental state in the picture. If they were correct, they got one point, and if they were incorrect they received no points. After the experiment, the researchers found that children with AgCC were less accurate and showed overall poorer performance in observing emotional states than the control group. As shown, the absence of the corpus callosum and any connection between both hemispheres of the brain limits their understanding of complex social cognitive functions (Lábadi & Beke, 2017).

However, when art therapy connects both hemispheres, there can be better social awareness and behavior as a result (Lábadi & Beke, 2017). Improved social relations through art therapy can not only help many neurobehavioral conditions (including autism, ADHD, and obsessive-compulsive disorder) but also give a sense of social purpose when one's surroundings are better understood. Therefore, art therapy promotes connections between both hemispheres of the brain that can improve the well-being of patients struggling with neurological conditions.

4.3 Neuroplasticity

Just as I discussed the connections involved with bilateral stimulation, new neural connections, and pathways can be formed as well when completing art (Konopka, 2014). Neuroplasticity is the brain's ability to form and organize neural networks, including after a learning experience or after an injury (Puderbaugh & Emmady, 2023).

In a 2014 study, Belkofer, Vaughan Van Hecke & Konopka measured the effects on the brain after 20 minutes of drawing. The study involved the use of an EEG to investigate the differences in patterns of brain activity among artists and non-artists. Results showed that for artists, there was strong activation in the left posterior temporal, parietal, and occipital regions of the brain. For non-artists, there was activation in the right parietal and right prefrontal areas of the brain. The authors believed that the different areas activated between artists and non-artists were due to the non-artists making new connections because of learning (Belkofer et al., 2014). These new connections formed when completing art can prove useful in Alzheimer's patients, which will be explained more in-depth later on.

5 Neurological conditions - PTSD

5.1 What is PTSD?

PTSD results from exposure to emotionally disturbing or life-threatening events. As a result, there can be lasting effects on someone's mental, physical, emotional, and social well-being. Traumatic experiences include but are not limited to physical abuse, poverty, childhood neglect, and racism (What Is Trauma?, 2018).

5.2 What happens to the body/brain during a traumatic event?

5.2.1 Stress

During a traumatic event, stress levels increase dramatically. Cortisol is rapidly produced, and if produced frequently enough, can disrupt developing brain circuits in young children (InBrief, n.d.). Even in adults, the continual production of cortisol is not healthy and can lead to long-term effects such as impairments in learning, memory, and the ability to regulate certain stress responses. Even after one traumatic event with the responses stated above, PTSD can be diagnosed. (Stress Disrupts the Architecture of the Developing Brain, n.d.).

5.2.2 Prefrontal Cortex

The prefrontal cortex is also affected by PTSD. In a 2005 study, 13 patients with PTSD and 13 without PTSD were shown images of expressions (happy, fearful, and neutral). Using fMRI, the researchers focused on blood oxygenation level-dependent (BOLD) signal responses. BOLD reflects changes in brain blood flow and blood oxygenation which can help to identify specific neuronal activities. The results, as shown in the graph, showed that BOLD signals decreased to the medial prefrontal cortex when the PTSD participants were shown images with fear (MR stands for the fMRI image). However, the control group

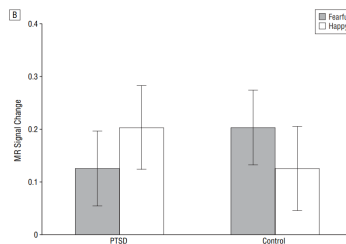


Figure 5: Prefrontal Cortex fMRI signals

had heightened awareness and increased BOLD signals to the medial prefrontal

cortex when presented with a fearful image. For the same stimuli, BOLD signals to the amygdala were measured as well. Researchers found that PTSD patients exhibited exaggerated amygdala responses (Shin, 2005). Essentially, in PTSD, the amygdala (the survival center) goes into overdrive as if the patient were experiencing that trauma for the first time. At the same time, the prefrontal cortex also becomes suppressed so there is less capability to control any emotions, such as fear (How Does Trauma Affect the Brain?, n.d.).

In another study, J. Douglas Bremner (1999) looked at the blood flow of Vietnam combat veterans when they were exposed to combat-related and neutral pictures/sounds. Researchers used positron emission tomography (PET) which uses radioactive substances to measure blood flow. In the study, there were Vietnam combat veterans with PTSD (n=10) and Vietnam combat veterans without PTSD (n=10). Individuals were shown neutral slides, winter scenes with nonverbal music, and combat slides, actual violent photographs from Vietnam. Scans showed that when veterans with PTSD were exposed to traumatic images, there was decreased blood flow in the medial prefrontal cortex. As mentioned in the previous paragraph, the hyperresponsivity of the amygdala results in decreased function of the prefrontal cortex as a way to cope with trauma (Bremner et al., 1999).

The prefrontal cortex works alongside the amygdala (as explained previously with the Singer-Schachter theory of emotions) to process emotional stimuli. So, since the prefrontal cortex is involved in memory, emotions, and social behavior, PTSD patients have difficulties in these areas when recalling a traumatic event (Kong et al., 2013).

5.2.3 Hippocampus

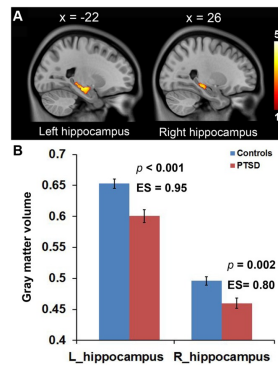


Figure 6: Effects on the Hippocampus

With PTSD, there are impairments and other effects on the hippocampus as well. MRI (magnetic resonance imaging) was performed on male miners involved in coal mine gas explosions. There were 14 with PTSD and 25 without. PTSD patients showed a decreased gray matter volume in the hippocampus compared

to their counterparts as shown in the graph to the right. Impairments in the hippocampus imply impairments in learning and memory (Zhang et al., 2014).

5.3 How can art therapy be useful in treating PTSD?

There are many ways that art therapy can benefit PTSD patients, and the positive effects of art therapy mentioned earlier in this paper align with problems caused by PTSD. For example, cortisol levels are lowered, the right and left brain are integrated, and the prefrontal cortex, hippocampus, and amygdala are activated (Czamanski-Cohen & Weihs, 2016; Duff et al., 2013; Kaimal et al., 2017; Kaimal, Ray, & Muniz, 2016; Malchiodi, 2003). However, perhaps more importantly, traumatic memories are stored nonverbally which can be accessed through art therapy. I made this statement earlier in the paper, but will now expand on this point. There are two ways that people deal with trauma. Healthy individuals move through the normal stages of grief and loss, while others shield their memories to seek emotional relief from the stress they cause. The suppression of these memories in PTSD patients is what causes all of the changes in the body and brain as mentioned before. So, a complication of PTSD is that traumatic memories are obscured and likely cannot be expressed verbally (Talwar, 2007).

Art therapy helps in this aspect because it helps access nonverbal memories through communication in the artwork. In a 2007 study, clients underwent an art therapy session and rated how they felt on a scale of 1-7 (7 being accepting of their experiences) after doing the art. Client A was a 58-year-old woman



Figure 7: Art Therapy Patient's Artwork

who worked in the field of mental health, and a recent experience with a client reminded her of her own childhood neglect and rejection. She had attended talk therapy previously but stated, "I need to work with the image; words are not enough" (p. 31). At the end of the session, she drew a horse, which represented freedom, strength, and wholeness. She rated how she felt as a 7 (Talwar, 2007). As shown, art therapy allows for self-expression which allows for access to blocked traumatic memories.

6 Neurological Conditions - Alzheimer's Disease

6.1 What is Alzheimer's?

Alzheimer's disease is a type of dementia that affects memory, behavior, and cognition. Most people with Alzheimer's are 65 and older. This disease worsens with time and has no cure. After some time, there are difficulties with speaking, swallowing, and walking, which can lead to difficulties living independently and eventually death. (What Is Alzheimer's Disease? Symptoms & Causes — Alz.Org, n.d.).

6.2 What happens to the body/brain with Alzheimer's?

With Alzheimer's disease, patients struggle with brain atrophy. Brain atrophy is a process where neurons are injured and die, connections between neurons break down, and brain regions begin to shrink. So, as the disease progresses, opportunities for neuroplasticity decrease. This process initially occurs in the hippocampus (memory) and eventually in other regions involved with language, reasoning, and social behavior. (NIH National Institute on Aging, 2017).

6.3 How can art therapy be useful in treating Alzheimer's?

As I mentioned before, there is no cure for Alzheimer's. Art therapy is not a cure for Alzheimer's but can alleviate symptoms and contribute to the well-being of patients in the early stages of dementia (Hill et al., 2011). In a 2005 study, Kinney & Rentz observed the well-being of individuals with Alzheimer's during an art program compared to other structured activities. To measure well-being, there were six categories: interest, sustained attention, pleasure, negative affect, sadness, and self-esteem. Each category had a description; for example, the pleasure was defined as "Verbal expression of pleasure while participating in the actual activity; eyes crinkled, smiles, laughter, relaxed facial expression; nods positively, relaxed body language". Before the art-making, observers measured the well-being of participants once per week. They were given indicators for each category of well-being; for example, indicators of pleasure were: "1. The participant has relaxed body language, smiles, and laughs during the activity. 2. The participant verbalizes a sense of pleasure with phrases such as: "this feels good," "this is relaxing," or in the "verbal expression of unintelligible phrases such as oooh, aah, accompanied with smiles, crinkling of eyes, or relaxed facial expression" (Kinney & Rentz, 2005, p. 224). Then, after the art-making process, the researchers measured the patients' well-being once again. The same method was used for participants who did not complete the artwork but instead another structured activity (e.g. following directions to make a toy plane). For participants who completed artwork, participants demonstrated better well-being in the categories of interest, attention, pleasure, and self-esteem. For the other group, there was no observed negative affect or sadness when they completed a structured activity (Kinney & Rentz, 2005). Even though this

study measured an abstract feeling of well-being, participants clearly showed increased positive attitudes. So, although art therapy cannot cure Alzheimer's, it can lead to an improved quality of life because of self-expression and creativity.

Art therapy, however, may be able to slow the progress of the early stages of Alzheimer's. A potential use of art therapy for Alzheimer's patients could be to increase neuroplasticity in an attempt to strengthen neural connections (Koch & Smampinato, 2022). However, there is little empirical research surrounding this topic but should be pursued due to art therapy's effect on neuroplasticity as mentioned earlier.

7 Efficacy & Validity

Art therapy is not a cure for Alzheimer's or PTSD but an effective form of treatment. However, treating symptoms is also important. For example, art therapy was useful for cancer patients with anxiety and depression. Cancer patients reported that their physical symptoms and mental health were alleviated after participating in art therapy. So, art therapy can improve the quality of life and treat some symptoms, but cannot cure, in this case, cancer (Hu et al., 2021).

Art therapy is not limited to a certain population and is helpful for patients of different ages and backgrounds. From the examples of studies I have given throughout this paper, the ages of the participants differ drastically. Patients could be children who faced childhood neglect or sexual abuse. Patients could also be grandparents diagnosed with dementia. There are a wide variety of age groups that can benefit from art therapy, and a number should not stop people from participating. Art therapy also does not discriminate in terms of multicultural differences. In a 2012 study, the sample included 133 Latino/Hispanic participants who were often excluded from research on aging and cognition. Results showed that cognitive functioning (memory, perception, learning, and language abilities) improved significantly among the experimental group following 10 weeks of art therapy (Alders, 2012). Even in the previous studies I mentioned, there was much diversity in ethnic backgrounds which did not make a significant difference in end results.

However, the efficacy of art therapy can be hindered if treatment is suddenly stopped. A 2011 study measured the cognitive and psychological effect of coloring and drawing in mild Alzheimer's disease patients. During a 12-week period of art coloring activities, some patients reportedly wandered around less and increased their daily average sleep time from 4.5 to 7.9 hours. However, once art therapy was stopped, the patients returned to their original sleep status (Hattori et al., 2011). If clients want long-lasting effects, it is important that they continually participate in art therapy.

Another limitation is that some art therapy studies may have a biased pool of people. Those who participate in art therapy experiments may only agree because they enjoy art therapy. However, those who do not like art therapy may not participate. This limits the participant diversity and may create a bias

in favor of art therapy.

8 Conclusion

Art therapy, although a relatively new field, has the potential to make significant developments in treating neurological conditions. The multitude of positive psychological and neurological effects on the body as mentioned above supports art therapy as an effective way to treat patients diagnosed with neurological conditions such as PTSD and Alzheimer's (Kinney & Rentz, 2005; Talwar, 2007).

Psychologically, art therapy works with images that do not solely require verbal communication from the patient. This can help with PTSD, where accessing painful memories can be difficult (Meekums, 1999). Art as a way of communicating can also help to uncover emotions, as shown by the pairing of the Singer-Schachter theory of emotions with the two-part process of art therapy (Yarwood, n.d.). Furthermore, memory can be strengthened through visual communication (artwork) as shown by the picture superiority effect (Paivio & Csapo, 1973). Physical materials/colors and images are also included in the visual aspect of art therapy and can result in positive attitudes and emotions (Holmes et al., 2006). In all, the visual aspect of art therapy is not only an alternative to talking, but it can contribute to better access to emotions, memories, and more.

These psychological effects of art therapy can not only benefit PTSD and Alzheimer's patients but others as well. For example, patients with depression can have improved moods. People with Parkinson's can have strengthened memory. People with anxiety may be able to regulate and control their emotions. Many people suffer and die from these various neurological conditions every day, but art therapy can help to minimize these struggles.

After the psychological effects of art therapy, I covered the neurological effects. I went on to explain the effects on the hippocampus and the prefrontal cortex. Overall, the activation of certain areas during art therapy may be linked to improving the function of these areas that are affected by certain neurological conditions.

After the psychological and neurological effects of art therapy, I delved into specific conditions that pertained to the positive results of art therapy. These two conditions are PTSD and Alzheimer's disease. PTSD results from exposure to a traumatic experience and can result in stress, damage to the prefrontal cortex, and impairments in the hippocampus (What Is Trauma?, 2018). Art therapy can prove useful not only because it activates the areas that are impaired during a traumatic event, but also because it can access the nonverbal traumatic memory through artistic expression (Talwar, 2007). Alzheimer's is a fatal type of dementia that affects memory, behavior, and thinking and progresses over time (What Is Alzheimer's Disease? Symptoms & Causes — Alz.Org, n.d.). Art therapy is not a cure for dementia, but it can improve well-being by improving patients' moods. There may also be connections with neuroplasticity, but there

has not been much empirical research done on this topic.

There are limitations to art therapy. Art therapy is not a cure for most conditions. In PTSD, the trauma caused by the event can never be 100 percent undone, but art therapy can improve the way that the patient deals with his/her trauma. In dementia, art therapy cannot cure brain atrophy but can improve well-being. Another possible downside of art therapy is that there can be negative consequences if treatment is suddenly stopped (Hattori et al., 2011). Another negative may be that some people may feel anger and reluctance toward art therapy because they view themselves to be bad at art and find it frustrating. A limitation of some art therapy studies is that there may be a selection or participation bias. This bias may be caused by a stigma associated with art therapy, and the idea that it is pseudoscience.

However, if art therapy is not attempted, people miss out on the opportunities for self-expression and neurological activation that are offered. Other types of therapies, such as verbal-based therapies, that do not involve the creative process may not result in the same outcomes as art therapy. Thankfully, art therapy is a broad genre that includes many mediums and is adaptable to fit a patient's needs (Hu et al., 2021). Existing research already shows how art therapy can help treat certain conditions, and there may be correlational evidence that art therapy can indirectly prevent deaths. For example, patients who are diagnosed with depression may be suicidal, and since art therapy improves well-being, it may help to prevent suicides. Also, if someone is feeling suicidal because of poor social relations, art therapy is a great resource to improve relationships and feelings of social acceptance. Students dealing with a lot of stress can reduce their cortisol levels through art therapy and reduce the risk of dying from heart disease (Stress Can Increase Your Risk for Heart Disease - Health Encyclopedia - University of Rochester Medical Center, n.d.). The implications of art therapy are numerous, but to uncover more we should encourage more people to engage with this research.

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