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The Impact of Art on the Brain: A Neuroscientific Perspective

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ABSTRACT

Art has played a vital role in human civilization for hundreds of years, shaping cultures and personal identities (Gussak & Rosal, 2025). This review examines the complex relationship between visual art and the brain, focusing on how both artistic production and artistic experience might affect both neural and emotional processes. The primary goal of this synthetic evaluation of the literature was to explore the complexities of how visual form, color, and style can influence cognitive states and aid emotional well-being. Using this orientation, a full literature review was conducted, yielding a synthesis of central themes from emerging findings in neuroscience, psychology, and art therapy. The articles examined included functional brain imaging, case studies of art therapy sessions, and experimental studies of creativity, and sought to make statements about the relationships between creative art-making and brain function. The consensus from the studies reviewed indicates that art-making activities involve complex patterns across networked brain areas that might include but are not limited to visual processing, emotion regulation, and memory systems. The report aims to further highlight the measurable and concrete ways that art has an impact upon the brain and mind.

INTRODUCTION

Art uses its appeal to serve as a substantial medium for expression, communication, and healing (Templeton Religion Trust). One of its main missions is to engage with multiple cognitive and emotional processes within the brain (Templeton Religion Trust). Previous studies have done investigations about the connection between art and the brain, interrogating how artistic betrothal influences neural procedures, emotional regulation, and cognitive development, with research ranging from neuroimaging studies to psychological analyses of art's effects. This research investigates how the brain perceives and processes art, the effects of visual elements on psychology, and the ways in which art can be utilized to maintain cognitive and emotional health. Understanding these dynamics can shed light on art's potential as both a cultural and therapeutic tool.

a) The value of art

Different theories about the value of art have been investigated over the past years, but, as philosopher Gordon Graham writes, “none of them on its own explain the special value of great art” (Templeton

Religion Trust). Instead, Graham says that the valuation of art can be criticized by its capability to serve as a source of knowledge and understanding—a concept known as aesthetic cognitivism. Aesthetic cognitivism suggests that art is a way of communication, understanding, and truth (Templeton Religion Trust, n.d.).

1. STRUCTURE OF THE BRAIN

To understand the effects of art on our brain, it is imperative to first gain a comprehensive understanding of how the brain functions (Lavdas, Sussman, & Woodworth, 2025).

a) Brain Anatomy

The brain is an organ collected from roughly 86 billion neurons. They work together to control our thoughts, emotions, movements, and sensory perceptions, which makes them highly complex organisms. The brain can be divided into specific parts, and each of them specializes in order to serve our general cognitive experience (Queensland Brain Institute, n.d.).

The occipital lobe is one of the most significant parts of our brain. It is involved in processing sensory information and located at the back of our brain. This lobe plays a crucial role as the primary visual cortex. As light enters the eyes, it is translated into electrical signals. These signals are transmitted via the optic nerve to the visual cortex. Temporal lobes process visual information. They are substantial in order to recognize objects and perceive faces. The fusiform gyrus is a part of the temporal lobe, and its primary goal is to differentiate between different objects (Queensland Brain Institute, n.d.). The fusiform gyrus is a large brain area located at the bottom (basal surface) of the two brain halves (cerebral hemispheres) and is situated on the bottom edge of the two lobes that make up the brain (the temporal and occipital lobes). It consists of the medial occipitotemporal gyrus and the lateral occipitotemporal gyrus, which are separated by an indentation or groove called the midfusiform sulcus. The fusiform gyrus plays a vital role in advanced processing of visual information—such as recognizing, categorizing and differentiating visual stimuli. It is also involved in forming new memories, integrating sensory information from multiple sources and processing perceptual data. The different areas of the fusiform gyrus are specialized for different functions and the areas of specialization demonstrate functional diversity within this one area of the brain. Additionally, the fusiform gyrus has a strong functional connection with another area of the brain called the angular gyrus, which has advanced capabilities for processing color. By virtue of this strong connection to both the visual information channel and the angular gyrus, the fusiform gyrus allows for integrated visual perception of color and shape (Kenhub, 2023). On the top of our brain, there are parts called “parietal lobes.” They also play a role in vision, specifically in incorporating sensory information from different modalities. Another important aspect of vision is visual attention. It is mainly controlled by a network that includes the frontal lobes. These particular parts make us focus on critical areas of our visual field. It is also filtering out irrelevant information, allowing us to concentrate on what is most important. Processing these various brain regions that work together to process visual information provides important information regarding the complexity of human perception.

HOW ART AFFECTS AND CHANGES THE BRAIN

Each level of processing within the brain supports a unique area of art engagement through distributed networks across the perceptual, cognitive, emotional, and motor functions of the individual. A previous study made by Bolwerk et al. (2004) used fMRI to investigate how art affects brain connectivity in a non-clinical sample of 28 post-retirement adults (mean age ≈ 63.7 years) (Barnett & Vasiu, 2024). Participants were assigned to a visual art production group or a cognitive art evaluation group (n=14) and attended two-hour sessions every week for over 110 weeks. The results showed significant neural changes in the art production group. Specifically, functional connectivity within the default mode network (DMN) increased (Dovizio, 2025), particularly between the posterior cingulate cortex/precuneus (PCC/preCUN) and prefrontal regions, including Brodmann areas (BA) 8, 9, and 10, as well as parietal areas such as BA 7, 39, and 40. These regions are central to introspection, autobiographical memory, and attentional control. On the other hand, the cognitive art evaluation group showed only modest connectivity increases, specifically from the right PCC/precuneus to the superior parietal lobule (BA 7), without any critical changes in the left hemisphere. Measurable psychological outcomes are linked to these neural changes.

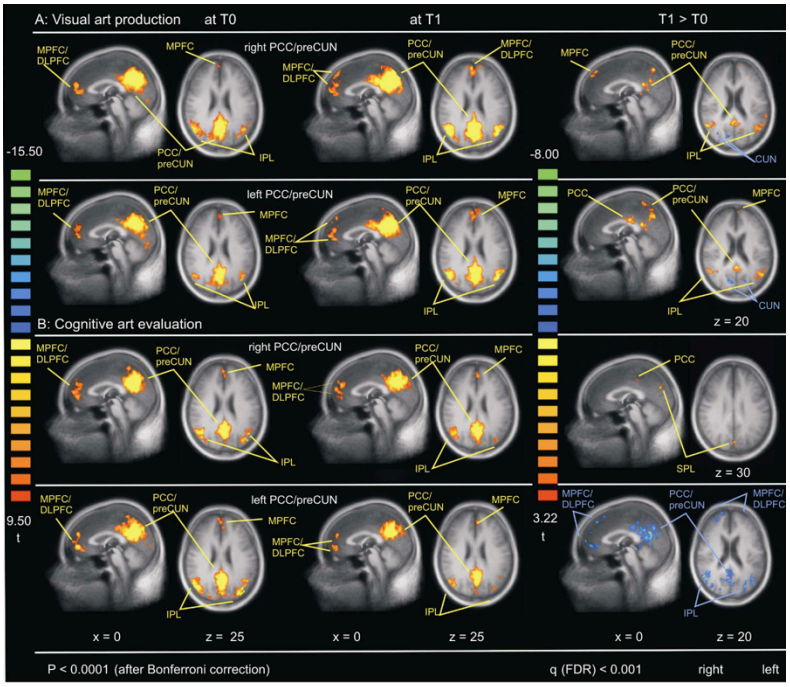


Image 1 (Bolwerk et al. 2004)

Resilience scores (assessed by the RS-11 scale) increased significantly from a pre-intervention mean of 60.64 ± 1.71 SEM to 63.50 ± 1.47 SEM (p = 0.013) in the visual art production group (Barnett & Vasiu, 2024). This kind of data was not observed in the cognitive evaluation group (pre: 62.57 ± 2.32 SEM; post: 64.79 ± 1.80 SEM, p = 0.195). In the correlation analyses, it appears that greater resilience at post-intervention was associated with stronger DMN connectivity to the prefrontal cortex (BA 8–10, r ≈ 0.60–0.63) and the superior/middle temporal gyri (BA 21–22, r ≈ 0.59–0.63). This indicates that art production not only fortifies connectivity in networks linked to memory and creativity but also improves the brain's ability to regulate stress and emotions. Furthermore, the sensorimotor cortex (S1/M1) exhibited stronger intraregional connectivity in the art production group. Collectively, these findings provide evidence that continued involvement in creating visual art leads to experience-based functional reorganization of higher-level brain networks during adult life. More specifically, increased connectivity

within the DMN and enhanced overall sensorimotor integration are indicative of network-based neural plasticity rather than providing definitive proof of structure/molecular changes. Since connectivity analysis via fMRI data are correlational, causality cannot be established by the present findings; however, they do demonstrate that the functional modulation of large neural networks involved with self-reference processing, emotional control, and motor coordination occurs as a result of creative acts involving visual arts. Furthermore, the positive relationship between increased DMN connectivity and improved resilience points to additional benefits associated with creative practice; through its reliance on integrative neural mechanisms, creating visual art may facilitate adaptive psychological functioning. Furthermore, while this study starts to establish the potential value of creativity within both preventative and rehabilitative settings, additional longitudinal and mechanistic investigations are needed before we fully understand the exact biological bases for the functional changes observed. (Bolwerk et al., 2014)

2. VISUAL PERCEPTION

After comprehensively exploring the anatomy of the brain and delineating the functions associated with each lobe, our focus shifts to the intricate examination of one of the brain's most sophisticated functions: vision. In discussions that intertwine art and neuroscience, it is essential to consider how art influences and interacts with our brain's processes. In order to begin visual perception, light needs to enter the eye and strike the retina, where it is converted into electrical signals by photoreceptors. These signals travel via the optic nerve to the brain's primary visual cortex in the occipital lobe. Then these signals are interpreted into constructed images by the brain. It allows us to perceive shapes, colors, and motion (Queensland Brain Institute, n.d.). The axons of ganglion cells leave the retina to form the optic nerve. They send projections to two principle sites, the thalamus (lateral geniculate nucleus (LGN)) and the superior colliculus (REBER, 2024). The LGN acts as the main relay site for transmitting visual information from the retina to the cortex, but only about 20 percent of this information for the LGN's afferent input comes from the retina; most of the input comes from structures in the brainstem and cortex (REBER, 2024). The LGN is more than a relay site because it represents a decision-making point in the visual pathway where cognitive states or needs can affect processing of visual information (REBER, 2024). The superior colliculus has a role in the movement of the head and eyes, therefore directing gaze. It also organizes saccadic eye movements, which are the quick jumps of the eye as seen when reading text (REBER, 2024). The superior colliculus, like the LGN, receives a large input from the cortex, and this input is first to answer for directing the eye's gaze (REBER, 2024).

3. IMPACT OF DIFFERENT ART FORMS, COLORS, AND STYLES ON THE BRAIN AND PSYCHOLOGY

a) Art Forms

The study of visual perception includes a range of areas, from neuroanatomical regions to cognitive functions of vision (Cherry, 2024). This knowledge serves as a background to our primary emphasis—importantly—the effect of artistic stimuli on neural function. Each art form elicits a different set of neuronal activation. Visual arts, such as painting or sculpture, primarily activate the occipital lobe

and prefrontal cortex, enhancing visual-spatial ability and emotional regulation. Performing arts, including dance and music, on the other hand, primarily activate sensorimotor areas (and the auditory cortex) to improve coordination and engagement with emotion. Literary arts, typically, activate areas of language that can increase empathy and improve narration comprehension (Cherry, 2024).

b) The Psychological Effects of Color

One 2020 study that included 4,598 people from 30 different countries showed that people commonly associate specific colors with different emotions (Verywell Mind, n.d.). At the end of the surveyed research, it appears that red stood out, with 68% of participants associating it with love**,** indicating its strong and perhaps universal connection to passion and emotion. Similarly, yellow was linked to joy by 52%**,** reinforcing its role as a color of brightness and positivity. Interestingly, pink was also strongly associated with love, with 50% of respondents linking the color to romantic or affectionate feelings. On the other end of the emotional spectrum, black was associated with sadness by 51%, and brown was linked to disgust by 36%, suggesting that darker hues may carry more negative emotional weight. These associations demonstrate how color perception is deeply embedded in emotional processing across cultures. The study's researchers suggested that such results indicated that color-emotion associations appear to have universal qualities. These shared meanings may play an essential role in aiding communication (Verywell Mind, n.d.) (Cherry, 2020).

4. USING ART TO MAINTAIN BRAIN HEALTH

Art plays a significant role in maintaining our brain health. The way art therapy rose as a prominent trend among individuals shows the crucial need for artistic expression in our society. In the following section, we will discuss the scientific bedrocks of our topic, exploring the psychological benefits and therapeutic implications of engaging with art (Fernandes, Evola & Ribeiro, 2022). Aesthetic experience concerns the appreciation of aesthetic objects and the resulting pleasure. Such pleasure is not derived from the utilitarian properties of the objects but linked to the intrinsic qualities of the aesthetic objects themselves. Hence, the aesthetic pleasure is disinterested (Kant, 1790). Aesthetic experiences can arise from the appreciation of human artifacts, such as artworks (e.g., poetry, sculpture, music, visual arts, etc.), or aesthetic natural objects like sunsets or mountain vistas. In this review, we refer to aesthetic experiences associated with the appreciation of artworks, particularly visual arts.

Aesthetic experiences can be received from multiple contexts (e.g., museums, galleries, and churches). Aesthetic experience is considered a rewarding process by some perspectives. These several perspectives suggested a link between aesthetic experience and pleasure (Berlyne, 1974; Leder et al., 2004; Silvia, 2005). Some studies suggest that art may be beneficial for maintaining brain health and psychological well-being. Particularly, it may be a potential therapeutic tool for many, e.g., adolescents, elderly, and vulnerable individuals. Aesthetic experience leads to enhancing the capability of perceptually engaging with an object experience; because of this specific reason, it has been associated with mindfulness meditation (Harrison and Clark, 2016). However, there is an ongoing debate about how exactly aesthetic experience affects cognitive and emotional states and promotes physical and psychological well-being

(Daykin et al., 2008). There are several theoretical lenses, suggesting different primary roles for cognitive and emotional factors in the aesthetic experience (Mastandrea, Fagioli & Biasi, 2019). All of these models have a common theme: that aesthetic judgment happens through the dialogue between stimulus features (bottom-up) and an evaluative process based on prior knowledge (top-down). This provisional evaluative process action displays something about those emotional outcomes and leads to a slightly changing emotional state in general, aligned with an overall mood and ready for mental health and well-being (Mastandrea, Fagioli & Biasi, 2019).

Numerous neuroimaging studies have shown that immediate emotional responses to artworks, or minor, enduring changes in affective states, involve the activation of some of the neural networks that underlie neurocognitive processes involved in reward, pleasure, and emotion regulation. This distinction makes sense when we consider the difference between emotional responses and affective states. For instance, aesthetically pleasing images activate reward-related areas of the brain, such as the medial orbitofrontal cortex, and are rated as more rewarding than unattractive images. Additionally, brief, transient mood changes during exposure to joyful and/or sad music that is classical in nature may also engage an emotion processing network involving the ventral and dorsal striatum, anterior cingulate cortex, and medial temporal areas.

General psychological well-being is not the only thing that can be healed by engaging with art; it can also be beneficial in order to prevent us from physical and mental illness. Art therapy is an expanding field that is useful for many situations, even for therapists who work with people who may not feel comfortable with directly talking about their problems (Suttie, 2023). One study found that coloring and drawing reduced people's heart rate and increased their respiratory sinus arrhythmia (a marker of good cardiovascular health) while making them feel less anxious (Suttie, 2023). Another study found that sculpting with clay may be beneficial to change wave patterns in our brains in ways that reflect a relaxed state. There is evidence that listening to poetry can have similar effects on the brain as listening to music can, giving us peak emotional experiences (Suttie, 2023).

These findings clearly suggest that art therapy and overall aesthetic experience have critical effects on our mental well-being.

5. ART THERAPY

The base idea of art therapy suggests that the process of art making is healing and life-changing (Brainerd, n.d.). It also indicates that art is a form of nonverbal communication of thoughts and feelings (American Art Therapy Association, 1996, in Malchiodi, 2003, p. 1). The theory that art therapy particularly implies that trauma or developmental conflict may not be accessible through typical verbal language but rather is stored in the unconscious in preverbal forms of sensory, kinesthetic, or imaginal cognitions and associated emotional experiences represented in symbolic language (Robbins, 2000; Wadeson, 2010). In order to access these proverbial ways of knowing and experiencing, it requires the development of an intentional therapeutic relationship or holding environment in which the therapist attunes to. The art therapist determines suitable artistic processes to express the client's emotional and relational status through emotional presence and attunement. This, in turn, fosters development of

metaphoric and symbolic language as part of reconstructing the client's own story (Gerber, 2014; Robbins, 2000). Outcome studies showed that long-term individual art therapy was effective in promoting cognitive and emotional development, enabling relationships, and lessening destructive behaviors in adults and children (Alders & Levine-Madori, 2010; Dudley, 2004; Evans & Dubowski, 2001; Henley, 2001; Klorer, 2000, 2005; Klorer & Robb, 2012; Kornreich & Schimmel, 1991; Kramer, 1977; McGregor, 1990; Ponteri, 2001; Smitheman-Brown & Church, 1996; Spring, 2001; Tipple, 2003).

One of the key roles in the development of art therapy is Margaret Naumburg. In the Walden School founded in 1915 by herself (1928), she recommended that all her teachers undertake analysis, and she encouraged the children in "spontaneous, free art expression," which caused "original and amazing images" seemingly "created from their unconscious." These experiences lead to her assurance that "such free art expression in children was a symbolic form of speech basic to all education... that such spontaneous art expression was also basic to psychotherapeutic treatment" (p. 30). Naumburg (1958) based her “art psychotherapy” theoretical framework and its methods on releasing spontaneous art expression; it has its roots in the transference relation between patient and therapist and on the encouragement of free association. Naumburg made clients use art in order to visually project their Naumburg used art as the means for clients to visually project their conflicts. For Naumburg (1958), the value of therapeutic art "is based on the recognition that man's most fundamental thoughts and feelings, derived from the unconscious, reach expression in images rather than words" (p. 511). Naumburg proposed once a patient had created nonverbal spontaneous imagery, they would make verbal associations to their pictures. She suggested that art therapy is a part of a transference relationship, but she underlined that her perspective departs from traditional methods. Her particular perspective encourages patients to take an active rather than a dependent role and interpret his or her own imagery. (Junge & Asawa, 1994, p. 24-25). Her vision clearly lies on the therapy part rather than the art aspect.

Another important role in the development of art therapy is Edith Kramer. He developed the term “art as therapy” (Ulman in Rubin, 1987, p. 281). Her premise was that the art process itself allowed the client to recreate primary experiences and feelings. It offered the opportunity to “reexperience, resolve, and integrate conflict” (Ulman in Rubin, 1987, p. 280). Kramer’s theory mainly centered around art as a therapy rather than as part of the therapy, as Naumburg suggested (Junge & Asawa, 1994, p. 31). Kramer used psychoanalytic theory to form her approach to art therapy, but she separated the role of the art therapist from that of the psychotherapist in no uncertain terms. She viewed her work as a particular form of art class; she named her clients as “students” and believed that art therapists must be as educated as teachers: “The art therapist communicates with his students via the students’ paintings, and this communication has therapeutic value. But he is no psychotherapist, and it is not his function to interpret deep unconscious content to his students. The basic aim of the art therapist is to make available to disturbed persons the pleasures and satisfaction that creative work can give.” (Kramer, 1958, p. 5). Kramer indicated that the art therapist “will not, as a rule, directly interpret unconscious meaning, but will use his knowledge to help the child produce artwork that contains and expresses emotionally loaded material” (Kramer, 1971, p. 34).

6. BROADER MENTAL HEALTH IMPLICATIONS

Art therapy has been recognized as a significant non-pharmacological solution for neurological and psychiatric conditions. It offers benefits that extend beyond motor function into cognitive and emotional domains. In Parkinson's patients often experience visual-cognitive impairments, mood changes, and diminished quality of life. For this particular problem, art therapy has arisen as a promising approach. Cucca et al. (2021) conducted a prospective exploratory trial in which eighteen PD patients participated in twenty structured art therapy sessions. The findings exposed improvements in visuospatial skills, eye movement efficiency, and motor function, accompanied by measurable changes in brain activity. Resting-state fMRI demonstrated increased connectivity within the primary and secondary visual networks (V1 and V2). These findings suggest that art therapy promotes functional reorganization in visual-related circuits.

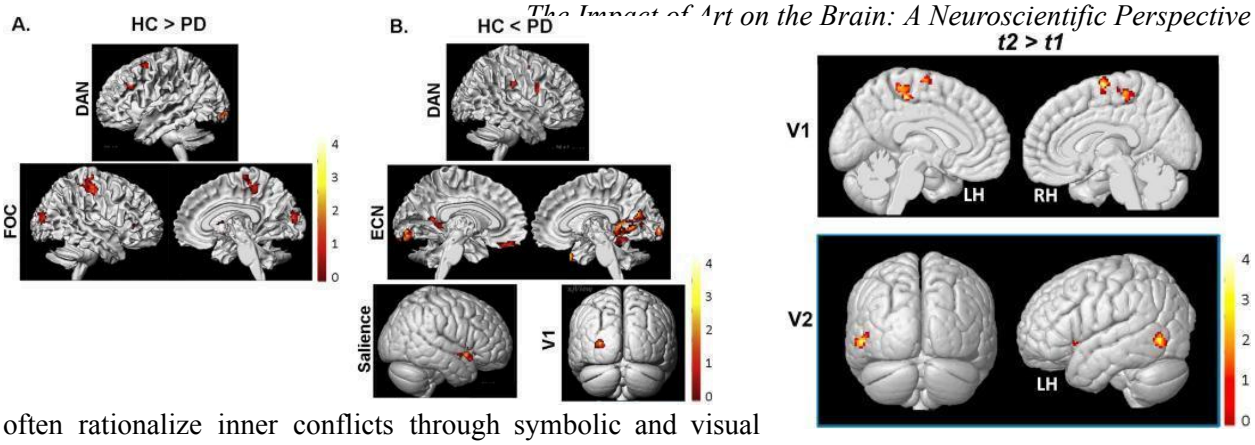
These neuroplastic adaptations highlight the potential for art therapy to target both perceptual and motor deficits in PD. It is possible to say these areas are often resistant to pharmacological treatment.

Parkinson's disease is not the only disorder that can benefit from art therapy. Its usage has been documented across a spectrum of mental health and neuropsychiatric disorders, including dementia, post-traumatic stress disorder (PTSD), chronic anxiety, and major depression (Cucca et al., 2021). In these populations, art-based interventions have been associated with reductions in depressive symptoms, improvements in emotional regulation, and enhanced social interaction. For instance, structured engagement with visual art has been shown to reduce caregiver burden in dementia patients by supporting self-expression and communication, while individuals with PTSD often report decreased intrusive symptoms and improved coping skills following creative therapy. These outcomes reflect the unique ability of art-making to integrate sensory, motor, cognitive, and emotional processes into a unified therapeutic experience.

When we consider all of the facts we have composed until now, we can say that art therapy functions are not limited to benefiting specific neurological deficits, just like in PD. It also addresses the broader psychological challenges associated with chronic illness. Art therapy contributes to neurocognitive resilience by enhancing visuospatial processing, promoting attentional flexibility, and providing an outlet for self-expression. It is also improving mental health and quality of life. Particularly, adapting art therapy into treatment paradigms holds significant promise for both neurological rehabilitation and psychiatric care. It emphasizes its role as a bridge between brain health and emotional well-being (Cucca et al., 2021).

a) Age-Specific Effects of Art Therapy

The overall effects of art therapy vary between different ages. Each age group receives unique psychological and neurological benefits (Gussak & Rosal, 2025). Art therapy is highly beneficial for children and adolescents, as it functions as a powerful tool for self-expression and emotional processing. According to the *International Journal of Medical Science and Applied Therapeutics* (2020), children



often rationalize inner conflicts through symbolic and visual representation. It makes art therapy particularly effective for addressing trauma, anxiety, and behavioral difficulties. It also improves cognitive development by strengthening imagination, problem-solving skills, and attention span. In clinical contexts, studies show that art therapy may reduce symptoms of post-traumatic stress disorder (PTSD) in younger populations while also supporting social development by encouraging peer interaction and empathy (IJMSAT, 2020). For adults, art therapy is significantly connected with stress reduction, improved coping strategies, and enhanced emotional regulation. The *IJMSAT* review highlights that it fosters mindfulness, self-reflection, and resilience, and these effects result in reducing depression and anxiety (Cucca et al., 2021; IJMSAT, 2020).

For older adults art therapy plays a more critical role as it plays a role in sustaining cognitive vitality and addressing psychosocial needs (Park & Maks, 2024). The creative engagement they experience during art therapy is significantly crucial, as it stimulates memory recall, visuospatial abilities, and executive functioning, while also reducing feelings of loneliness and isolation. The *IJMSAT* review underlines its benefits for individuals with dementia and Alzheimer's disease. They also note particular improvements in mood, reduced agitation, and preservation of personal identity through artistic self-expression (IJMSAT, 2020). In order to sum up, art therapy shows a lifespan-adaptive effectiveness. It supports emotional articulation and resilience in children, stress management and self-reflection in adults, and cognitive as well as emotional enrichment in older populations. When we consider these findings, supported by clinical and review-based evidence, we can confidently say that art therapy is a holistic intervention capable of meeting the developmental and psychological needs of individuals across different age groups (Cucca et al., 2021; IJMSAT, 2020).

Image 2 (Cucca et al., 2021)

Image 3 (Cucca et al., 2021)

b) Using Our Brain More Effectively with Art

The process of creating art can be counted as a form of mental exercise. It stimulates neural connections and improves cognitive abilities. Recent studies state that art is a valuable tool for maintaining brain health, as it helps to improve memory, attention, and problem-solving skills. Enjoying art seems to contribute to our flourishing, say Magsamen and Ross, helping us to stay healthier and happier (Suttie, 2023). Kaimal says that art's ability to flex our imaginations may be one of the reasons why we've been making art since we were cave-dwellers; her theory states that art might serve an evolutionary purpose and help us navigate problems that might arise in the future (Gharib, 2020). She wrote about this in October in the *Journal of the American Art Therapy Association*. Kaimal believes the brain uses information to make predictions about the future and what we need to do in order to survive. According to her, art making activates this predictive and decision-making capacity. When individuals engage with art, they make a continuous series of cognitive decisions (Gharib, 2020). This sequence of choices engages various neural systems, promoting both analytical thinking and emotional processing, and ultimately contributes to the brain's adaptive functioning. Studies show that creating art is connected with increased functional connectivity and activation of the visual cortex. Researchers state that just as physical activity supports bodily health, engaging with artistic creation may help maintain mental health and cognitive sharpness. Beyond these cognitive benefits, it also helps us to manage stress and cope with daily challenges.

As an important aspect of the learning process, engaging with art offers a valuable opportunity to enhance general quality of life. Taking an active role in artistic experiences can serve as an effective exercise for the brain, fostering both intellectual growth and emotional well-being (UAGC Staff Member, 2021).

The human brain processes artistic experiences through a complex interplay of sensory, cognitive, and emotional networks. Neuroscientific studies demonstrate that engaging with different art forms not only activates distinct brain regions but also enhances neuroplasticity, emotional regulation, and creative thinking. While visual arts primarily stimulate perception and spatial reasoning, music engages auditory and reward pathways, and literature strengthens language networks and empathy. Film and photography integrate visual processing with narrative memory, while crafts combine motor learning with mindfulness. The table below summarizes the primary brain regions activated by each art form, the mechanisms of their influence, and the key processes they promote (UAGC Staff Member, 2021).

Table 1: Primary Brain Regions Activated by Each Art Form

Art For	Primary Brain Regions Activated	How It Affects the Brain	Key Processes Involved
Visual Arts (Painting, Drawing, Sculpture)	Occipital lobe (visual cortex), parietal lobe (spatial processing), prefrontal cortex (planning/creativity), limbic system (emotion)	Visual input stimulates perception, colors/forms trigger emotional response, decision-making regions engage in composition/planning	Visual perception, motor coordination, creative problem-solving, emotional regulation
Music (Listening & Performing)	Auditory cortex (temporal lobe), hippocampus (memory), prefrontal cortex, motor cortex, cerebellum, nucleus accumbens (reward)	Rhythm & melody engage auditory pathways; dopamine release creates pleasure; motor areas activate in performance	Auditory processing, memory recall, reward response, motor timing, emotional expression
Literature & Creative Writing	Temporal lobe (language), prefrontal cortex (imagination), hippocampus (memory), default mode network	Reading/writing stories strengthens imagination, enhances empathy, activates autobiographical memory	Language comprehension, creativity, empathy, self-reflection
Film & Photography	Occipital lobe, limbic system, prefrontal cortex	Visual narratives engage memory and emotion; editing/creating activates planning/creative networks	Storytelling, visual memory, emotional processing

Crafts (Ceramics, Knitting, Handicrafts)	Motor cortex, cerebellum, parietal lobe, prefrontal cortex	Fine motor skills improve hand-brain coordination; repetitive actions calm the brain	Motor learning, concentration, stress reduction

METHODS

The literature search was conducted systematically using a range of academic search engines and databases (e.g., PubMed, ScienceDirect, Google Scholar). The search terms and phrases included “art and the brain,” “neuroaesthetics,” “art therapy,” "neuroplasticity," and "visual perception." The timeframe of interest for publication dates was between the years 2000 and 2024. Peer-reviewed articles or similar articles and credible reports were included as long as the source was scholarly in nature and credible. Additional sources were obtained from legitimate scientific periodicals or institutional websites; this allowed for cross-disciplinary representations. The search was narrowed to literature written in English focused on human subjects and neurological or psychological effects of art.

Eligible studies were empirical studies, reviews, and theoretical papers that studied the neural, cognitive, or emotional effects of art engagement. Studies with priority were those using experimental designs, neuroimaging approaches, or clinical interventions of art therapy. Articles focusing on non-human subjects only, unrelated disciplines, or those that were not scientific in nature (e.g., editorials) were not eligible.

Key data was extracted based on selected papers, which included information such as authorship, publication year, research design, demographic information about participants, methodological types (fMRI, EEG, psychological testing, etc.), findings related to brain function and emotional regulation, and conclusions of the paper. Data extraction was done manually with thorough cross-checking for accuracy.

The extracted data were analyzed and synthesized through a narrative synthesis whereby the evidence was organized into thematic categories such as brain regions involved in art processing and creating, mechanisms of neuroplasticity, cognitive and emotional effects, and application for therapy. This approach allowed multiple types of study design and outcomes to be considered together in a single framework that describes the connections between art and brain functioning.

Though a formal quality assessment tool was not utilized, attention was focused on selecting high-impact and peer-reviewed studies that followed high-quality methods. We prioritized studies with identified experimental controls and reliable measures to improve the reliability of the overall conclusions developed.

RESULTS

The findings from this research provide evidence of the complexity and interconnection between artistic engagement and brain function, emphasizing the depth of cognitive, emotional, and therapeutic impact that art can have. An analysis of neuroscientific literature, perspectives on visual cognition, and empirical literature suggests that engagement with diverse art forms stimulates multiple areas of the brain—mainly the occipital, temporal, and prefrontal cortices—promoting visual-spatial processing, memory storage, and emotional processing.

Visual perception begins with stimulation of the retina, which leads to the optic nerve and then continues to the primary areas, such as the lateral geniculate nucleus (LGN) and visual cortex (V1), as well as higher-order areas of the cortex (V2, V4, and IT cortex). These areas integrate an object's shape, motion, color, and emotional content. Studies have demonstrated that viewing art was associated with increased activity in the fusiform face area, dorsolateral prefrontal cortex (DLPFC), and medial orbitofrontal cortex, all of which are regions implicated in aesthetic appraisal, memory, and reward, respectively.

Art exposure produces multifaceted emotions, engendered through activation of the brain's rewards and emotional processing networks. Neuroimaging studies have found consistent activated areas during aesthetic experiences, specifically the anterior cingulate cortex and striatum. The engagement of color, form, and symbolism influences our mood, motivation, and psychological resiliency through emotional engagement. The literature highlights color psychology or color therapy that indicates colors (e.g., red, blue, and black) that are innate to emotional states such as love, calm, and sadness, along with their associated engagement/controllability potential.

The evidence suggests that the making and observing of art promotes neuroplasticity. Activities such as drawing, sculpting, and viewing work that is visual art related have been shown to correlate with enhancements in functional connectivity and gray matter density in brain areas related to executive function and stress regulation. These effects appear most pronounced in the context of art therapy, where participants experience reductions in stress markers (e.g., cortisol), increases in heart rate variability, and generally enhanced moods following interventions. The findings also support the efficacy of art-based interventions in clinical populations such as those with PTSD, depression, and neurodegeneration.

In an educational context, visual arts have been shown to foster empathy, retention of information, problem-solving skills, and other aspects of cognition. By using visual thinking skills—engaging both hemispheres of the brain—learners can better conceptualize highly abstract ideas of complexity. Integrating arts with STEM (by adding "A" for "Art," which transforms STEM into STEAM) correlates with increased imaginative thinking, versatility, and creative intelligence. Studies show students exposed to high-aesthetic content on average achieve higher scores on assessments measuring critical thinking and emotional literacy.

Neuroaesthetics provides evidence in favor of the brain's natural responsiveness to beauty and artistic structures. In a study using functional neuroimaging, the brain experienced organizing properties through

the medial orbitofrontal cortex and the ventromedial prefrontal cortex, which relate to subjective value and emotional pleasure. Artworks relating to an emotional negative experience (i.e., visual imagery of sorrow) can generate a positive effect because of aesthetic distancing and can allow individuals to experience catharsis and emotional growth without any risk of psychological impairment.

DISCUSSION

This research emphasizes the powerful influence of art on the brain and supports the premise that engagement in art improves neural connectivity, emotional health, and cognition. From an interdisciplinary perspective, which consists of neuroeducation, psychology, and aesthetic studies, it is clear that the interplay of visual perception, neuroaesthetics, and emotional processing on brain connectivity, plasticity, and mental health is evident.

A major finding from the research is the topic of neuroplasticity and its relation to artistic engagement. In summary, the research conducted thus far supports the idea that engagement with art affects the way large-scale neural systems work based on how many times you participate in that type of activity. The most compelling evidence comes from observations that show functional connectivity and psychometric score correlations (such as RS-11), while other studies did not use direct measurements of individual cell type plasticity or anatomy. Therefore, while the current results suggest that engagement with art enhances the integration of the various functions associated with self-identifying oneself, regulating one's emotions, and coordinating one's body movements, there has been no direct correlation to an increased number of synapse connections made or any type of molecular change. Further studies using multiple methods will need to be done to determine if the overall changes in the brain's activities are actually permanent and if there will be structural changes due to engaging in this type of art activity. This is very beneficial for an individual recovering from neurological trauma or for cognitive deficits, as art therapy has been demonstrated to enhance memory, focus, and emotional regulation. Neuroimaging studies further confirm that engaging in art activates the limbic system and prefrontal cortex, revealing that engagement with art and creativity can be seen as a way to express oneself and as a way to enhance cognition and self-regulation skills. Bolwerk et al. (2014) found that a long-term, structured intervention focused on visual arts production led to greater functional connectivity among the DMN, as measured by fMRI (as seen by an increase in connectivity between the PCC and precuneus with other areas of the frontal and parietal lobes) relative to the pre-agenda activity levels and score on RAPA. Moreover, these findings were supported by an increase in resiliency as measured by a change in the score from pre- to post-intervention. While this is supported by evidence of network-level alterations in functional connectivity, the authors noted that it is based on a relatively small sample of older adults and thus, there may be alternative explanations for the changes seen in functional connectivity in the study (i.e., increased social interaction and/or increased structured cognitive engagement, and/or increased overall activity level). Therefore, while the findings from the study did suggest that artistic creation has the ability to stimulate large-scale adaptive changes to the memory and self-reflective networks of the brain, it does not provide sufficient mechanistic evidence of cellular neuroplasticity. Future studies using

randomized research designs that include an active control group along with multimodal imaging methods (e.g., MRI, DTI, PC) could help to better understand the mechanisms that underlie these changes. Secondly, the findings also confirmed the psychological power of color. Color perception, a neurally driven behavior, plays an important role in emotional behavior. The research findings demonstrated that some colors can reduce stress, increase awareness, or promote relaxation, therefore contributing to the value of color in therapy practice. The study also demonstrated color is a perception influenced by personal and cultural undertones that pulls for personalized levels of treatment to be the most favorable. The study also reinforces the theoretical foundations of aesthetic cognitivism that describe art as a way to comprehend understanding. This can be supported through neuroscience, which has evidenced that visual(-spatial) thinking skills, especially when produced through artistic engagement, strengthen problem-solving skills, critical thinking skills, spatial awareness, etc. This evidence supports the recommendations made by researchers to utilize the arts to support both creative and critical thinking skills in everyday contexts as well as education.

The findings of this research underscore the profound impact of art on the human brain, supporting the hypothesis that artistic engagement enhances neural connectivity, emotional well-being, and cognitive functioning. Through an interdisciplinary lens combining neuroscience, psychology, and aesthetics, the study highlights how visual perception, neuroaesthetics, and emotional processing interact to influence the brain's plasticity and mental health.

These implications affect many areas: clinical, educational, and cultural. Clinically, art therapy has been a powerful way to address emotional healing for people who have experienced trauma, stress, or depression. Art therapy is a form of treatment that does not involve medications and has been studied for its potential benefits on patients with neurological and psychiatric disorders. Research (e.g., Cucca et al., 2021) has shown that through participation in structured art sessions, patients with Parkinson's Disease exhibit the following positive changes: improved visuospatial ability; better motor functioning; increased connectivity between Visual Area 1 & 2 (V1/V2) during resting state due to increased interconnectivity between these areas. Interpretation of these findings implies that the processes of either functional re-organization or altered usage of perceptual networks provide opportunities to enhance the quality of a patient's life via improved behavior. Because of the relatively small sample sizes, coupled with the predominantly correlational nature of the brain imaging results, the findings should be interpreted as Pilot or Pre-clinical studies, suggesting that the application of an art-based intervention will have beneficial effects on both cognitive and emotional functioning through modulation of the brain's network function. The study supports the proposed integration of artistic practices into therapeutic programs focused on mental health and emotional resilience. In education, the cognitive magnification from visual thinking allows arts-based curricula to support new educational achievements and expansiveness in the areas of empathy, creativity, and innovation. The evidence generated from these findings adds to increased support for the extension of STEM to STEAM (Science, Technology, Engineering, Arts, and Mathematics).

The research achieved its objectives by examining the structure and function of the brain and changes to psychological states using visual and emotional stimuli and a plethora of pathways leading to art as a vehicle for enhancing well-being and education by linking it to a factual basis for what art is. The

consistency of support for the link between aspects of artistic activity and increased normal-functioning brain clearly exists across all investigations.

LIMITATIONS

Despite the encouraging nature of these findings there are some major limitations. First the majority of neuroimaging evidence presented in this paper has relied on correlational methods such as resting-state fMRI that identify connectivity patterns over time. Although these methods are able to identify large-scale brain network connectivity changes related to individual experience they cannot identify specific cellular or molecular changes taking place that lead to changes in brain structure.

Second, neuroimaging provides a snapshot of brain activity when the subject is in a defined state (e.g., calm state, viewing an art piece, during or immediately following an intervention). Therefore, neuroimaging cannot be relied upon to demonstrate how these changes evolve over time and that the neural changes identified were due to the task, attention and/or arousal and whether they last after the individual has finished performing the task. Follow-up research will be needed to determine how long these changes persist (or do not) for the individual.

The subjective experience of art makes it hard to measure this variability between people using an objective standard. Factors like your background, culture, feelings, preferences, and life experiences shape how you interact with art, as do your behaviours and brain activity when looking at or creating art. For this reason, researchers can't easily compare results from study to study and some of the difference among studies' findings could be due to differences in populations or methods used.

In addition, many of these studies focus on small samples, older patients or people who have specific medical conditions, and a structured, group-oriented intervention. Therefore, other variables besides the effects of art on behaviour and brain activity (e.g., social interactions, expectation effects, cognitive stimulating activities) may influence how an individual studies or is involved with the arts. The presence of these variables in studies makes it difficult for researchers to determine exactly how much of the observed change in behaviour and brain activity is caused by engagement in art.

Because there are so many ways that people engage with art (drawing, painting, sculpting, or viewing), and significant variation in the design of interventions, the findings from these studies may not apply to all forms of art engagement. Future studies need standardized protocols, larger and more varied samples of study participants, and multimodal forums using physiological, behavioural, and molecular measures, in addition to neuroimaging methods, to clarify the connection between art engagement and brain function.

SUGGESTIONS FOR FUTURE RESEARCH

Future research should investigate longitudinal work to assess the enduring effects of artistic engagement and its influence on neural development and emotional resilience. Further, performing neuroaesthetic studies in more diverse populations will allow for cultural differences in perception and appreciation of art to be explored. There is also scope for interdisciplinary work between neuroscientists, artists, and educators detailed here; this area could be furthered in terms of how art can better integrate into health and education.

CLOSING THOUGHT

Overall, the research shows that art is more than just a source of aesthetic delight; it is also a critical cognitive and emotional force. In a world that is changing rapidly and is predominantly mediated through digital interfaces now more than ever, developing and sustaining the artistic habit may be one of the most powerful humanizing and neurologically uplifting pursuits we can promote. While science and society become increasingly complex and perplexing, we will continue our engagement with art as a tool for healing, born from learning and communicating with others, because it is vital to our health and well-being.

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