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Neuroarts and Neuroaesthetics

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Abstract

Recent advancements in neuroarts and neuroaesthetics have elucidated the relationship between artistic engagement and neural processes, emphasizing the impact of aesthetic experiences on cognitive and emotional well-being. Central to this exploration is the NeuroArts Blueprint initiative, which consolidates interdisciplinary research to better understand the impactful role of the arts on brain function and health outcomes. Empirical studies highlight how exposure to art, such as music or visual stimuli, activates neural circuits involved in emotion regulation, memory, and reward processing, particularly engaging the medial orbitofrontal cortex. Innovations such as haptic and electro-tactile devices have introduced novel sensory modalities that not only augment aesthetic appreciation but also hold therapeutic promise for sensory processing disorders. Likewise, computational neuroaesthetics is a burgeoning subfield employing machine learning (ML) algorithms to model aesthetic preferences and uncover neural correlates of artistic perception, offering quantifiable insights into how individuals experience art. Despite these advances, significant research gaps persist, particularly regarding cultural and individual variability in aesthetic responses and the long-term neural effects of artistic engagement. Future directions include adopting inclusive frameworks that integrate diverse artistic traditions and employing longitudinal methodologies to explore how sustained exposure to the arts influences neural plasticity. Advances in neuroimaging techniques and personalized neuroaesthetic interventions may also facilitate tailored experiences that optimize therapeutic outcomes, especially for neurodivergent populations

Keywords: *neurodiversity, aesthetic perception, therapeutic interventions, neuroplasticity, computational neuroaesthetics, sensory processing disorders, neural correlates of aesthetic experience, art-based neurotherapeutics, multisensory integration in art perception, emotional regulation*

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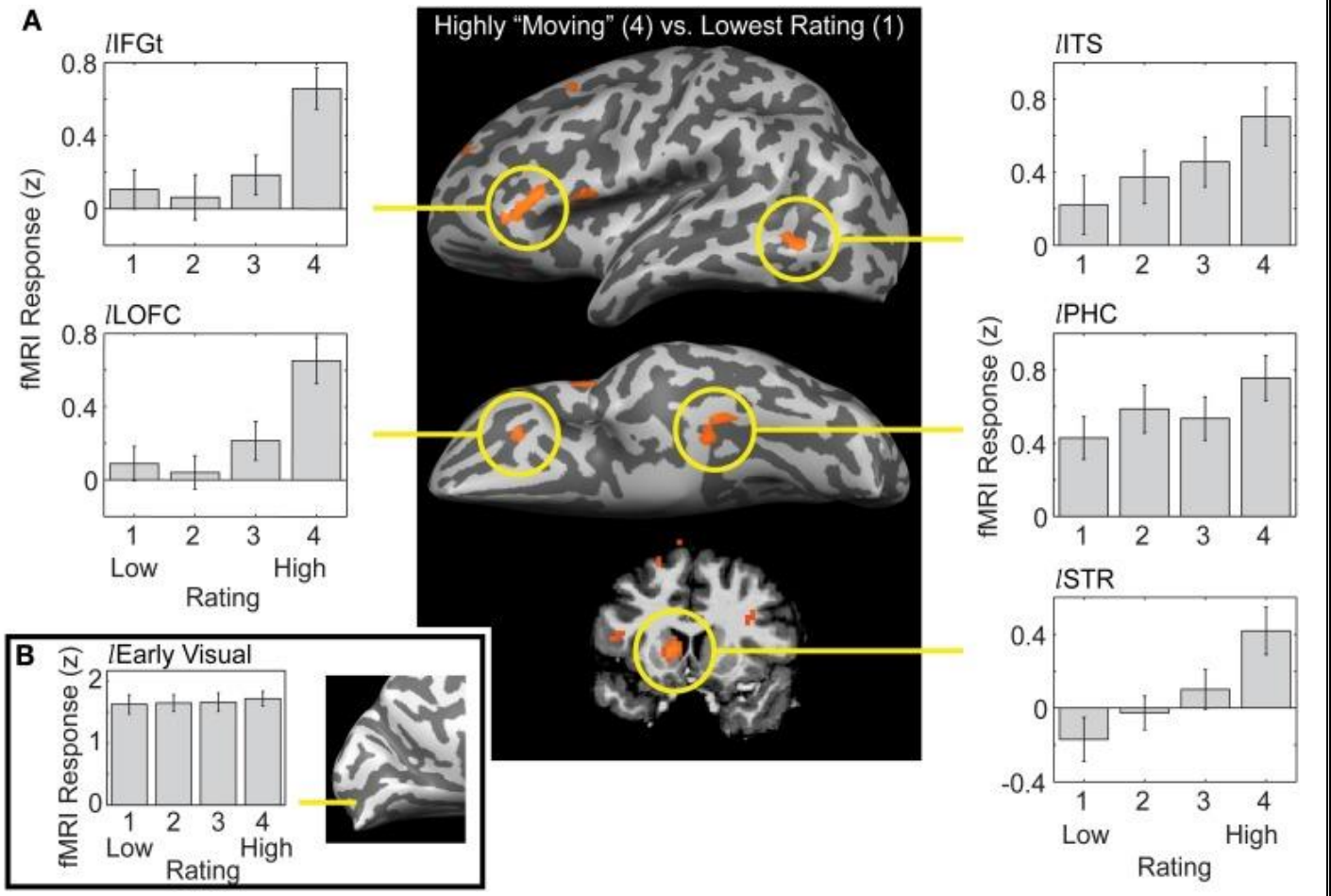
1. Introduction

Neuroarts and neuroaesthetics represent dynamic interdisciplinary domains that merge neuroscience, psychology, and art to explore the profound ways artistic engagement influences the human brain and body. Neuroarts, an emerging field, investigates how art forms such as music, visual art, dance, and architecture enhance health and well-being through therapeutic applications and multisensory engagement [1]. In parallel, neuroaesthetics considers the neural mechanisms that underpin aesthetic experiences, providing empirical evidence of the capacity of art to evoke transformative emotional and cognitive effects [2]. Together, these disciplines underscore the dual role of art as a medium of individual expression and a scientifically validated tool for promoting mental and emotional resilience. This integration not only advances scientific understanding but also inspires innovative approaches to health and well-being through creative expression.

The significance of neuroarts lies in its ability to unify artistic expression and scientific inquiry, leveraging advancements in technologies like neuroimaging and wearable sensors to map real-time brain responses to artistic stimuli [3]. This growing field has demonstrated that engaging with art activates multiple brain systems, including reward pathways, sensory processing, and motor functions, thereby fostering neuroplasticity and emotional regulation (Fig.1) [4]. Notably, initiatives such as the NeuroArts Blueprint have institutionalized this exploration, emphasizing the integration of arts and neuroscience to improve global health outcomes [5].

Figure 1. Distinct patterns of response to artworks as a function of their ratings in a distributed network of brain regions. Copyright © 2013 Vessel, Starr and Rubin (CC BY).



Current research highlights the therapeutic potential of neuroarts, including the efficacy of music therapy for cognitive improvement in dementia, dance therapy for mitigating Parkinson's symptoms, and poetry for emotional solace in end-of-life care [6-8]. However, the field also embraces critical discourse, addressing cultural and individual variability in aesthetic responses, the neural basis of sensory differences, and ethical considerations in therapeutic practices. Future directions emphasize inclusivity, personalized interventions, and longitudinal studies to uncover the enduring impact of artistic engagement on mental health and neural development. These advancements position neuroarts and neuroaesthetics as transformative disciplines with the potential to enrich human experience and foster societal well-being.

2. The Neuroscience of Art and Healing

The interplay between neurology and the arts reveals the profound impact of artistic engagement on the brain's structure and function, offering insights into how art fosters cognitive, emotional, and social well-being. Contemporary neuroscience explores the intricate neural pathways activated by artistic stimuli, from visual art to music, highlighting their roles in emotional regulation, sensory integration, and executive functioning. This burgeoning field underscores art as more than aesthetic enjoyment—positioning it as a tool for therapeutic intervention and cognitive development. Through a synthesis of ancient practices and modern scientific inquiry, neuroarts illustrates the brain's plasticity and its capacity to adapt through creative experiences. Section 2.1 considers the neurological mechanisms behind the arts' effects,

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bridging interdisciplinary perspectives to illuminate their profound implications for human health and well-being.

Art has long been intertwined with healing practices, serving as a medium for emotional expression, spiritual balance, and physical restoration across cultures and epochs. From ancient Egyptian tomb paintings to Renaissance depictions of human emotion, art has been a conduit for exploring the human condition, providing solace and fostering resilience. These historical practices laid the groundwork for the modern integration of art into therapeutic frameworks. Section 2.1.1 examines these traditions, tracing the evolution of art's healing role through diverse cultural practices, philosophical insights, and their eventual synthesis with contemporary neuroscience. This exploration offers a rich perspective on how art's enduring significance has shaped its current applications in health and wellness.

2.1 Neurology and the Arts

Research increasingly highlights the profound effects of artistic engagement on the brain, with a particular emphasis on well-being [9-11]. Neuroarts and neuroaesthetics, which sit at the intersection of neuroscience, art, and technology, emphasize this transformative relationship [1]. Engagement with art—such as colorful paintings—stimulates dopamine release, invoking pleasure and well-being akin to other rewarding experiences like food or social connection [12]. Such findings underline art's active role in engaging complex neurological pathways, from sensory processing to emotional regulation.

The scientific study of how the brain reacts to art merges traditionally independent disciplines: art history and neuroscience. Art historians have focused on aesthetic, cultural, and interpretive dimensions, while neuroscientists have studied brain functions and structures through empirical methods. Seminal research by Zeki [13-14] demonstrated that viewing beautiful art activates the same neural structures engaged by feelings of love, including the orbitofrontal cortex, amygdala, and ventral striatum. Beyond visual pleasure, art engagement reduces stress, improves memory, and enhances critical thinking [15-16]. Art fosters mindfulness and emotional health, making it a vital component of well-being.

Art also stimulates the prefrontal cortex, crucial for decision-making and sensory interpretation, with implications for neurodivergent individuals. The neurodiversity framework views neurological differences—such as autism, ADHD, and dyslexia—not as deficits but as natural variations [17]. For example, creating or appreciating art can help individuals with autism explore emotions and empathy, while offering those with ADHD an outlet for creativity and focus. Installations like Google's *A Space for Being* [18] underscore how sensory environments shape well-being, highlighting neuroarts' potential to address diverse cognitive and emotional needs.

The neuroarts framework aligns with the social model of disability, which sees disability as a result of societal barriers rather than individual limitations [19]. While transformative, this model has been critiqued for oversimplifying the biological and psychological realities of disability [20]. A biopsychosocial approach integrates these elements, fostering nuanced understandings of how neuroarts can bridge gaps in inclusion and accessibility. By embracing neurodiversity, the arts contribute to a society that values diverse sensory and neurological experiences, advancing well-being through creativity and empathy.

2.1.1 Historical Foundations of Art and Healing

While the modern field of neuroarts and its connection to neuroscience emerged in the late 20th century, the therapeutic use of art extends back to antiquity, deeply rooted in diverse cultural and historical contexts [21]. Ancient civilizations recognized the transformative and healing power of art, embedding it within religious, social, and medical practices. In ancient Egypt, art served as a bridge between life and the afterlife, with elaborate tomb paintings and sculptures believed to ensure spiritual tranquility and protection [22]. Similarly, in ancient Rome, healing temples such as Asclepieia integrated music, theater, and visual arts as essential elements of patient care, showcasing art's central role in holistic healing regimens [23]. Greek philosophers like Aristotle emphasized the cathartic nature of drama, particularly tragedy, advocating its emotional purging and therapeutic virtues [24].

The Renaissance period marked a pivotal moment in the intersection of art and health. Influenced by humanist ideals, Renaissance art celebrated individuality and holistic well-being, using detailed portrayals of human emotions and nature to uplift spirits and promote mental equilibrium [25]. Indigenous cultures worldwide also integrated art into healing practices. Native American sand paintings aimed to restore harmony, while ancient Chinese calligraphy and Indian Rangoli connected spiritual practices to mental tranquility and balance [26-28]. Aboriginal Australian dot paintings symbolized spiritual connection and healing, emphasizing ancestral ties and land [29]. These traditions underscore art's timeless role in fostering well-being and cultural cohesion.

The integration of art into therapeutic frameworks gained formal recognition in the mid-20th century, with figures like Adrian Hill and Margaret Naumburg pioneering art therapy as a clinical practice. Hill, a British artist recovering from tuberculosis, first articulated the therapeutic potential of art in 1942, laying the groundwork for art therapy's inclusion in medical care [30]. In the United States, Naumburg championed art as a means to access the unconscious mind, employing it as a psychotherapeutic tool for children and adolescents in psychiatric settings, further advancing the field [31].

The contemporary model of "Arts on Prescription" exemplifies the ongoing evolution of these practices. Originating in the UK, social prescribing integrates arts and cultural activities into healthcare, addressing mental and physical health by leveraging local artistic resources. Programs like CultureRx in the United States extend this model, prescribing cultural engagement to reduce anxiety, improve mental health, and foster community connections [32]. This approach not only broadens healthcare options but also ensures equitable access to diverse artistic activities tailored to individual needs. For neurodivergent individuals, art offers alternative avenues for social engagement, emotional expression, and cognitive stimulation, exemplifying its inclusive potential. The enduring integration of art into healing reflects its capacity to bridge cultural traditions and modern therapeutic practices, offering a holistic approach to health and well-being.

3. Results

Studies demonstrate that engaging with art activates distinct neural pathways associated with reward, emotional regulation, and cognitive processing. Behavioral analyses reveal that participants effectively distinguish between aesthetic qualities, reinforcing the idea that art engagement involves complex cognitive and emotional mechanisms. These findings highlight the therapeutic potential of

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art, particularly in addressing mental health challenges and fostering emotional resilience. While the research underscores the transformative power of artistic engagement, it also points to the need for standardized methodologies and interdisciplinary collaboration to advance the integration of art into therapeutic and educational frameworks. This growing body of work supports the notion that art can play a vital role in enhancing well-being and enriching human experience across diverse contexts.

3.1 Experimental Results

Studies have considered the interdisciplinary nexus of neuroaesthetics and cognitive science, such as that by Lin et al. [33], which employed geometric shapes to probe principles of balanced composition through computational aesthetics. Key features such as symmetry, center of gravity, and negative space were quantified and categorized using cluster analysis, forming a robust framework for aesthetic evaluation. Participants engaged in tasks requiring balance and aesthetic judgment while their neural activity was monitored through electroencephalography (EEG) and functional magnetic resonance imaging (fMRI). Early-stage EEG data (0–600 ms) revealed significant neural differences between "Yes" and "No" responses, particularly in prefrontal, frontal, and central regions, where negative waves were more pronounced during "No" responses. Parietal-occipital and occipital regions, conversely, displayed larger positive wave activations under the same condition. Late-stage EEG analysis (600–1000 ms) further indicated heightened average amplitudes for "Yes" responses, particularly in aesthetic tasks, illustrating deeper neural engagement during these evaluations [33].

Complementing these findings, fMRI data emphasized the orbitofrontal cortex's critical role in processing visual art, associating it with the brain's reward systems and emotional regulation mechanisms. Participants who underwent psychological assessments using the Resilience Scale (RS-11) demonstrated enhanced self-reflection and emotional stability, attributed to their engagement with visual stimuli [34]. These results align with the theory of processing fluency, which posits that the ease of cognitively processing aesthetic stimuli correlates with favorable aesthetic judgments. The dual components of aesthetic processing—objective stimulus properties and subjective perceptions—underscore the complex interplay between emotional and cognitive mechanisms in aesthetic experience [35]. Moreover, research reveals that the default mode network (DMN), typically deactivated during focused task performance, remains active or experiences reduced deactivation when individuals view highly moving artworks (Fig.2). This suggests that such art can alleviate the cognitive suppression associated with task performance, allowing for a deeper engagement with self-referential and emotional processing. The emotion-valuation neural system, including the orbitofrontal cortex, integrates these emotional responses with cognitive mastery, highlighting the multifaceted nature of aesthetic perception [36]. These findings collectively advance our understanding of the neural and psychological mechanisms underpinning art's transformative potential.

Figure 2. The default mode network (DMN) deactivation during task performance is alleviated when viewing highly moving artworks.
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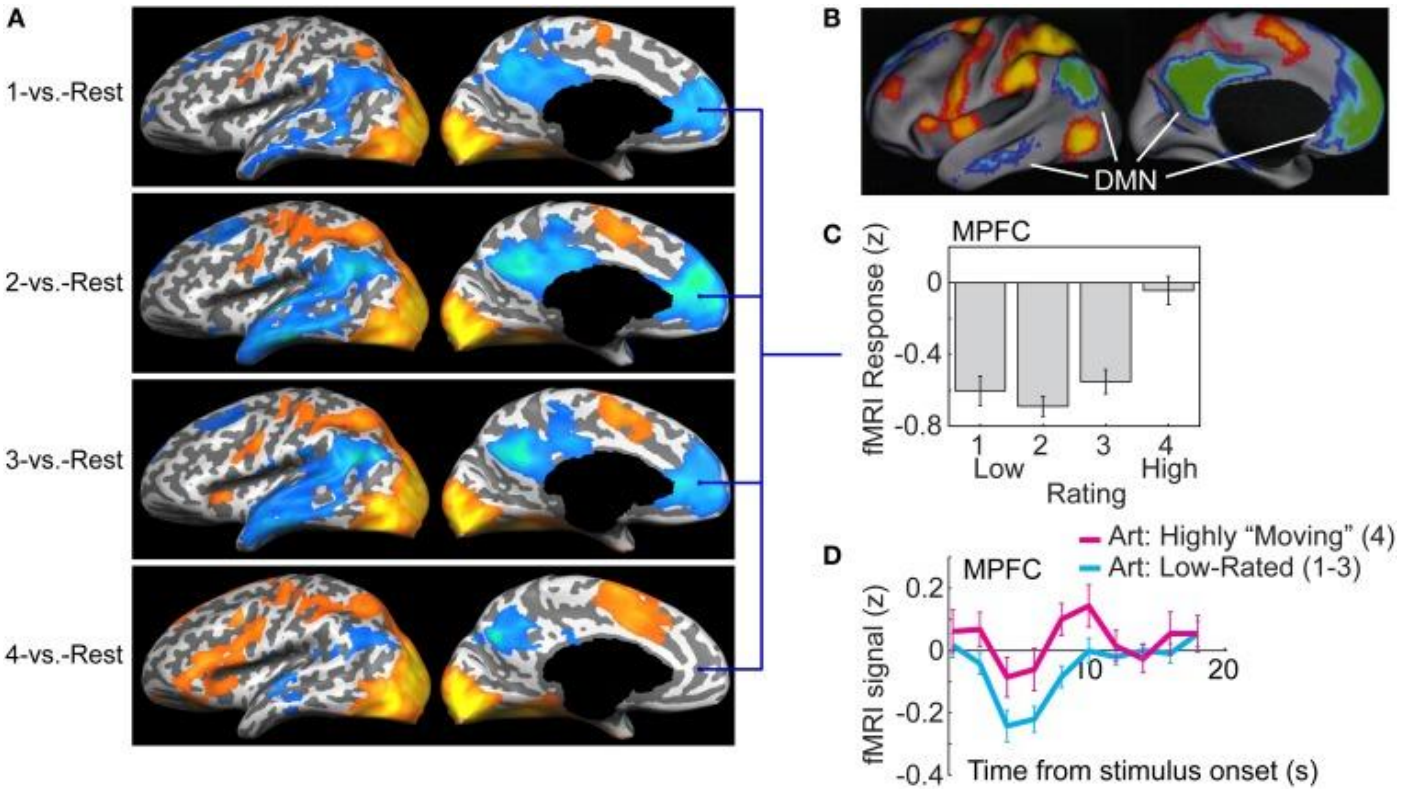

3.1.1Implications of the Findings

The implications of these findings extend into clinical contexts, particularly in art therapy and mental health interventions. Creative modalities like visual art and music have shown promise in treating conditions such as PTSD, traumatic brain injuries (TBI), and anxiety disorders. For example, art therapy has demonstrated significant efficacy in alleviating symptoms of trauma and facilitating recovery through non-verbal emotional expression [37-38]. However, methodological inconsistencies and limited controlled trials hinder the generalizability of these results, underscoring the need for standardized research protocols and

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longitudinal studies [39-40]. Despite these challenges, the therapeutic potential of art remains evident, particularly in promoting emotional regulation, enhancing resilience, and improving overall quality of life.

Beyond clinical applications, the study also emphasizes the need for a cohesive research framework in neuroaesthetics. Inconsistent terminology and limited cross-disciplinary collaboration present significant barriers to progress, impeding the synthesis of findings across diverse fields. A unified approach to data collection, analysis, and reporting would enhance the comparability and applicability of results, enabling the development of tailored interventions for varied populations [40]. By addressing these challenges, neuroaesthetics can realize its potential to integrate artistic engagement into therapeutic, educational, and societal frameworks, fostering emotional and cognitive growth on a global scale. The findings advocate for the continued exploration of art's neural and psychological impacts, emphasizing its transformative role in enhancing well-being and enriching human experience.

The research highlights the significance of neuroaesthetic principles in understanding how visual stimuli influence cognitive processes and emotional responses. By systematically exploring the intersection of art and neuroscience, these studies deepen our comprehension of aesthetic experiences and pave the way for innovative therapeutic applications, particularly in neurorehabilitation. Integrating neuroaesthetic findings into rehabilitation protocols has been shown to enhance their effectiveness [41-42]. The observed neural responses underscore the pivotal role of aesthetic engagement in fostering emotional and psychological well-being, affirming the potential of art as a powerful tool to improve quality of life across diverse populations.

3.1.1.1 Interpretation of Results

The interpretation of the results provides significant insights into the complex interplay between aesthetic appreciation, cognitive processes, and neural mechanisms. The EEG data from sixteen participants, with a robust dataset after excluding two for data quality concerns, underscores the reliability of the findings. Despite an average data rejection rate of 6.7%, the analysis captures essential interactions between aesthetic judgments and task-related parameters. Behavioral data revealed no statistically significant main effects for answer or task factors on accuracy, as confirmed by a repeated measures ANOVA ($F < 1$). However, the accuracy rates across experimental conditions consistently exceeded 90%, suggesting that participants were adept at distinguishing between balanced and aesthetically pleasing compositions, a critical finding supporting the study's framework [33].

The dual components of aesthetic processing emerge clearly, encompassing both the aesthetic object as the stimulus and the subjective experience of the perceiver. This interplay aligns with theories positing that aesthetic valuation results from a synergy of objective stimulus features and the subjective emotional and cognitive engagement of the perceiver [10]. Such findings reinforce the idea that aesthetic appreciation is not a passive experience but involves active cognitive and emotional mechanisms. Emotional responses linked to aesthetic experiences are shown to be deeply rooted in biological processes, transcending basic emotions. The concept of empathetic engagement with artwork highlights the unique ability of aesthetic emotions to promote well-being and health, expanding our understanding of their therapeutic potential.

The theory of processing fluency offers further context, suggesting that the ease with which an aesthetic object is cognitively processed correlates with more favorable judgments. This underscores the nuanced nature of aesthetic evaluations, where emotional engagement intertwines with cognitive processing fluency to shape perception. Neural mechanisms, particularly the emotion-valuation system, provide critical insights into the aesthetic judgment process. Brain regions such as the orbitofrontal cortex (OFC) are identified as key players in evaluating aesthetic experiences across sensory modalities, highlighting the multifaceted dimensions of aesthetic perception [36]. This involvement of the system demonstrates how cognitive mastery integrates self-referential information with aesthetic properties, emphasizing the deeply embedded nature of aesthetics in cognitive and emotional frameworks.

Overall, these findings suggest that aesthetic appreciation extends beyond surface-level engagement with stimuli to involve complex emotional and cognitive mechanisms. This interpretation not only advances the theoretical understanding of aesthetic processing but also underscores the practical implications of these insights, particularly in therapeutic contexts where aesthetic engagement can foster well-being and resilience. By integrating these elements, the study provides a comprehensive view of the neural, emotional, and cognitive underpinnings of aesthetic experience, contributing significantly to the broader discourse in neuroaesthetics and its applications.

The experimental conclusions underscore the profound role of artistic engagement in fostering emotional and cognitive well-being, as evidenced by findings from controlled laboratory settings and real-world environments such as museums. The research highlights a shared physiological mechanism underlying aesthetic processing, emotional engagement, and the neural reward system, suggesting robust implications for therapeutic and educational applications. The consistent activation of these neural pathways across diverse contexts affirms art's potential to serve as a universal medium for enhancing mental health, resilience, and learning.

Art therapy emerges as a particularly valuable intervention, with documented benefits for individuals with traumatic brain injuries (TBI), post-traumatic stress disorder (PTSD), and other mental health conditions. Creative modalities such as painting, music, and dance have been integrated into psychotherapy to address symptoms of anxiety, depression, Alzheimer's, and autism. These interventions provide non-verbal avenues for emotional expression and recovery, particularly for populations that may face challenges with traditional therapeutic approaches [37-38]. However, despite its promise, art therapy faces critical challenges due to the scarcity of rigorous, well-controlled trials clarifying its neurobiological mechanisms. This gap limits the broader applicability and integration of art therapy into mainstream healthcare.

Future research must address these limitations by prioritizing methodological standardization and conducting longitudinal studies that explore the physiological and psychological mechanisms underlying art's therapeutic impact. Larger sample sizes and replicable study designs are essential to ensure the reliability and generalizability of findings. Additionally, advancing our understanding of how creative arts contribute to emotional regulation and neural plasticity can inform tailored therapeutic interventions that cater to diverse populations and individual needs [39-40].

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Key barriers, including inconsistent terminology and insufficient interdisciplinary collaboration, impede the synthesis of insights across the field. To foster progress, stakeholders must establish a unified framework for data collection, analysis, and reporting. Achieving consensus on terminology, outcome measures, and reporting standards will enhance the comparability of studies and facilitate the aggregation of findings into a cohesive body of knowledge [43-45]. Addressing these barriers will not only enrich the scientific foundation of neuroarts but also enable its practical application across therapeutic, educational, and societal contexts.

Future research should also explore the integration of advanced neuroimaging technologies, such as functional connectivity analysis, to deepen our understanding of the neural networks engaged by artistic experiences [46]. Embracing cross-cultural perspectives is critical to investigating the universal and culturally specific aspects of aesthetic appreciation [47]. Additionally, examining the role of virtual and augmented reality in creating immersive art-based interventions could open new avenues for therapeutic applications. By addressing these research priorities and fostering interdisciplinary collaboration, the field of neuroarts can continue to expand its impact, bridging science and art to enhance individual and collective well-being [48-50].

4. Conclusions and Prospects

Neuroarts and neuroaesthetics represent a rapidly evolving interdisciplinary frontier that bridges art, neuroscience, and psychology, offering profound insights into how artistic engagement influences the brain, mind, and behavior. These fields illuminate the ability of art to activate neural pathways associated with reward, emotional regulation, and cognitive processing, underscoring its transformative potential in promoting mental health and well-being [51]. Through experimental findings, it becomes evident that art extends beyond aesthetic appreciation, serving as a therapeutic tool capable of fostering resilience, reducing stress, and enhancing emotional and cognitive capacities.

The integration of art into clinical and educational contexts has demonstrated promising outcomes, particularly in addressing mental health challenges, trauma recovery, and neurodevelopmental disorders [52]. However, significant barriers persist, including inconsistent methodologies, a lack of standardized terminology, and limited cross-disciplinary collaboration. Addressing these challenges requires a unified framework for research that incorporates standardized approaches to data collection, analysis, and reporting. Such a framework would enable more reliable and generalizable insights, enhancing the applicability of findings across diverse populations and settings.

A critical consideration in advancing neuroaesthetics is the ethical imperative to ensure accessibility and inclusivity. While the therapeutic potential of art is well-documented, its benefits must be equitably distributed [53]. This involves addressing socioeconomic disparities that limit access to artistic experiences and considering the needs of neurodivergent populations who may require tailored interventions. Furthermore, cross-cultural research is essential to ensure that diverse artistic traditions are valued and integrated into therapeutic and educational frameworks. Ethical practices in neuroaesthetics must also navigate concerns about privacy, particularly when employing neuroimaging and biometric data, emphasizing informed consent and the responsible use of emerging technologies.

Looking forward, future research should embrace advanced technologies such as neuroimaging, machine learning, and immersive virtual environments to explore the neural mechanisms underlying artistic engagement further. Longitudinal studies are crucial for understanding the enduring impacts of art on neural plasticity, emotional well-being, and cognitive development. Additionally, cross-cultural investigations will help identify universal and culturally specific aspects of aesthetic experiences, enriching the global applicability of findings. By integrating diverse perspectives, the field can build a more inclusive understanding of how art influences the brain and mind.

As neuroarts and neuroaesthetics continue to evolve, their integration into therapeutic, educational, and societal frameworks holds immense potential. Collaborative efforts among scientists, artists, educators, and clinicians can unlock innovative pathways for improving individual and collective well-being. By bridging art and science, these disciplines offer a vision of a future where creativity not only enriches human experience but also addresses pressing global challenges, from mental health to social equity. Through ethical and inclusive approaches, neuroarts and neuroaesthetics can truly realize their transformative potential, fostering resilience, empathy, and a deeper connection to the human condition.

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References

1. Magsamen, S.; Ross, I. *Your Brain on Art: How the Arts Transform Us*. Random House, 2023.
2. Chatterjee, A., & Vartanian, O. Neuroaesthetics. *Trends in cognitive sciences*, 2014; 18(7), 370-375.
3. Cheung, M. C.; Law, D.; Yip, J.; Wong, C. W. Emotional responses to visual art and commercial stimuli: implications for creativity and aesthetics. *Frontiers in psychology*, 2019; 10, 14.
4. Von Bernhardi, R.; Bernhardi, L. E. V.; Eugenín, J. What is neural plasticity?. *The plastic brain*, 2017; 1-15.
5. Magsamen, S.; Golden, T. L.; Towriss, C. A.; Allen, J. The impact thinking framework: a process for advancing research-to-practice initiatives in neuroaesthetics. *Frontiers in Psychology*, 2023; 14, 1129334.
6. Zhang, Y.; Cai, J.; An, L.; Hui, F.; Ren, T.; Ma, H.; Zhao, Q. Does music therapy enhance behavioral and cognitive function in elderly dementia patients? A systematic review and meta-analysis. *Ageing research reviews*, 2017; 35, 1-11.
7. Michels, K.; Dubaz, O.; Hornthal, E.; Bega, D. "Dance Therapy" as a psychotherapeutic movement intervention in Parkinson's disease. *Complementary Therapies in Medicine*, 2018; 40, 248-252.
8. Clary, P. L. Poetry and healing at the end of life. *Journal of Pain and Symptom Management*, 2010; 40(5), 796-800.
9. Cotter, K. N.; Harrouche, M.; Rodriguez-Boerwinkle, R. M.; Boerwinkle, M.; Silvia, P. J.; Pawelski, J. O. Virtual art visits: Examining the effects of slow looking on well-

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DOI: 10.5281/zenodo.15300620

being in an online environment. *Psychology of Aesthetics, Creativity, and the Arts.* 2023.
10. Mastandrea, S.; Fagioli, S.; Biasi, V. Art and psychological well-being: Linking the brain to the aesthetic emotion. *Frontiers in psychology*, 2019; 10, 739.
11. Secker, J.; Heydinrych, K.; Kent, L.; Keay, J. Why art? Exploring the contribution to mental well-being of the creative aspects and processes of visual art-making in an arts and mental health course. *Arts & Health*, 2018; 10(1), 72-84.
12. Puranik, V. Looking at colorful art helps our brain improve its well-being. *Medicinal Media*, November 14, 2023: https://www.medicinal-media.org/explore/colorful-art-helps-the-brain
13. Zeki, S. The neurobiology of love. *FEBS letters*, 2007; 581(14), 2575-2579.
14. Zeki, S. Splendours and miseries of the brain. Philosophical Transactions of the Royal Society of London. Series B: *Biological Sciences*, 1999; 354(1392), 2053-2065.
15. Raad, G.; Tanios, J.; Azoury, J.; Daher, A.; Fakih, C.; Bakos, H. W. Neurophysiology of cognitive behavioural therapy, deep breathing and progressive muscle relaxation used in conjunction with ART treatments: a narrative review. *Human Reproduction Update*, 2021; 27(2), 324-338.
16. Windle, G.; Joling, K. J.; Howson-Griffiths, T.; Woods, B.; Jones, C. H.; Van de Ven, P. M.; Parkinson, C. The impact of a visual arts program on quality of life, communication, and well-being of people living with dementia: a mixed-methods longitudinal investigation. *International Psychogeriatrics*, 2018; 30(3), 409-423.
17. Dwyer, P. The neurodiversity approach (es): What are they and what do they mean for researchers?. *Human Development*, 2022; 66(2), 73-92.
18. Uszerowicz, M. At Google Design's A Space For Being, Good Aesthetics Are Good for the Brain. *Cultured*. April 9, 2019: https://www.culturedmag.com/article/2019/04/09/google-design
19. Oliver, M. *Understanding disability: From theory to practice.* Macmillan International Higher Education, 1996.
20. Shakespeare, T. *Disability rights and wrongs revisited*. Routledge, 2014.
21. De'Souza, C. *Art and Neuroscience: The Historical Emergence and Conceptual Context of Neuro-Art.* Doctoral Dissertation. School of Humanities and Social Science, Jacobs University, Bremen, 2012.
22. Allen, J. P. *The art of medicine in ancient Egypt*. Metropolitan Museum of Art, 2005.
23. Burge, G. M. *A Week in the Life of a Roman Centurion*. InterVarsity Press, 2015.
24. Ferrari, G. R. F. Aristotle on musical catharsis and the pleasure of a good story. *Phronesis*, 2019; 64(2), 117-171.
25. Thibault, G. E. Humanism in medicine: what does it mean and why is it more important than ever?. *Academic Medicine*, 2019; 94(8), 1074-1077.
26. Samuels, J. Healing sand: A comparative investigation of Navajo sandpaintings and Tibetan sand maṇḍalas. *Journal of Ritual Studies, 1995;* 101-126.
27. Zhang, Y. H.; Rose, K. *A brief history of qi.* Paradigm Publications, 2001.
28. Surapaneni, K. M. Enriching Anatomy Education with the Integration of Rangoli: Nurturing Cultural Practices in Medical Education. *Medical Science Educator*, 2023; 33(5), 1293-1293.
29. Bennett, T. Indigenous art and the contemporary Australian art field. *Global Art in Local Art Worlds: Changing Hierarchies of Value*, 2023; 2. `
30. Chapin, M.; Fish, B. The therapist as artist. In *Approaches to art therapy*, 2016, Routledge; pp. 33-49.
31. Junge, M. B. History of art therapy. *The Wiley handbook of art therapy*, 2015; 7-16.
32. Golden, T. L.; Maier Lokuta, A.; Mohanty, A.; Tiedemann, A.; Ng, T. W.; Mendu, M.; Brinza, T. (2023). Social prescription in the US: A pilot evaluation of Mass Cultural Council's "CultureRx". *Frontiers in Public Health*, 2023; 10, 1016136.
33. Lin, F.; Song, W.; Li, Y.; Xu, W. Investigating the Relationship between Balanced Composition and Aesthetic Judgment through Computational Aesthetics and Neuroaesthetic Approaches. *Symmetry*, 2024; 16(9), 1191.
34. Bolwerk, A.; Mack-Andrick, J.; Lang, F.; Dörfler, A.; Maihöfner, C. How art changes your brain: Differential effects of visual art production and cognitive art evaluation on functional brain connectivity. *Plos One*. July 1, 2014: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0101035
35. Mastandrea, S.; Fagioli, S.; & Biasi, V. Art and psychological well-being: Linking the brain to the aesthetic emotion. *Frontiers in psychology*, 2019; 10, 739.
36. Li, R.; Zhang, J. Review of computational neuroaesthetics: bridging the gap between neuroaesthetics and computer science. *Brain Informatics*, 2020; *7*(1), 16.
37. Malhotra, B.; Jones, L. C.; Spooner, H.; Levy, C.; Kaimal, G.; Williamson, J. B. A conceptual framework for a neurophysiological basis of art therapy for PTSD. *Frontiers in human neuroscience*, 2024; 18, 1351757.
38. Barnett, K. S.; Vasiu, F. How the arts heal: a review of the neural mechanisms behind the therapeutic effects of creative arts on mental and physical health. *Frontiers in Behavioral Neuroscience*, 2024; 18, 1422361.
39. Coccagna, M.; Pietro, A.; Mariagrazia, P.; Giovanni, V.; FABBRI DESTRO, M.; Alessandro, S. V.; Mazzacane, S. Neuroaesthetics of art vision: An experimental approach to the sense of beauty. *Journal of Clinical Trials*, 2020; *10*(2), 1000404-1.
40. NeuroArts Blueprint. *Executive Summary: NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing*. International Arts + Minds Lab, 2022: https://neuroartsblueprint.org/blueprint-report/
41. Oliva, A.; Iosa, M.; Antonucci, G.; De Bartolo, D. Are neuroaesthetic principles applied in art therapy protocols for neurorehabilitation? A systematic mini-review. *Frontiers in Psychology*, 2023; 14, 1158304.

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DOI: 10.5281/zenodo.15300620

42. Wang, S.; Sanches de Oliveira, G.; Djebbara, Z.; Gramann. The embodiment of architectural experience: A methodological perspective on neuro-architecture. *Frontiers in human neuroscience*, 2022; 16, 833528.
43. Siler, T. Neuroart: picturing the neuroscience of intentional actions in art and science. *Frontiers in Human Neuroscience*, 2015; 9, 410.
44. Fancourt, D.; Finn, S. *What is the evidence on the role of the arts in improving health and well-being? A scoping review*. World Health Organization. Regional Office for Europe, 2019.
45. Macnaughton, J.; White, M.; Stacy, R. Researching the benefits of arts in health. *Health Education*, 2005; 105(5), 332-339.
46. Del Campo, M. A.; Kehle, T. J. Autonomous sensory meridian response (ASMR) and frisson: Mindfully induced sensory phenomena that promote happiness. *International Journal of School & Educational Psychology*, 2016; 4(2), 99-105.
47. Garzón Chiriví, O. A. Approach to a State of the Art of Traditional and Popular Medicinal Practices in Hispano-American. *Folios*, 2015; (41), 157-168.
48. Singh, S.; Sabahat, M.; Qamrudiin, J. The Impact of Architecture in the Process of Healing & Well-Being. *International Journal for Research in Applied Science & Engineering Technology*, 2021; 9(3).
49. Mather, G. *The psychology of visual art: Eye, brain and art.* Cambridge University Press, 2013.
50. Taylor, J. B. *Whole brain living: The anatomy of choice and the four characters that drive our life*. Hay House, Inc, 2021.
51. Roe, A. W.; Chelazzi, L.; Connor, C. E.; Conway, B. R.; Fujita, I.; Gallant, J. L.; Vanduffel, W. Toward a unified theory of visual area V4. *Neuron*, 2012; 74(1), 12-29.
52. Goodley, D. Disability studies: An interdisciplinary introduction. *Disability Studies*, 2016; 1-296.
53. Radulski, E. M. Conceptualising autistic masking, camouflaging, and neurotypical privilege: Towards a minority group model of neurodiversity. *Human Development*, 2022; 66(2), 113-127.

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