



# Sensemaking and Neuroaesthetics

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## Neuroarts and the Spectrum of Neurodiverse Experiences

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James Hutson · Piper Hutson ·  
Morgan Harper-Nichols

palgrave  
macmillan

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ISBN 978-3-031-58044-4      ISBN 978-3-031-58045-1 (eBook)  
<https://doi.org/10.1007/978-3-031-58045-1>

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*This manuscript is fervently dedicated to our spouses, children, families, and friends, who have been the unwavering pillars of support throughout this journey. Your infinite patience, love, and understanding have been the bedrock that sustained us through the moments of doubt and the long hours of research and writing. Your enduring encouragement and presence have not only provided sanctuary but also a profound source of inspiration, transforming this endeavor into a shared voyage of growth and discovery. Morgan Harper-Nichols extends a heartfelt thank you to her family and friends for their continuous encouragement and steadfast support in this journey. Piper and James Hutson specifically dedicate this work to their children, who have been an endless fountain of inspiration throughout the study.*

*We also extend our deepest gratitude to all the neurodivergent individuals who courageously shared their stories with us. Your contributions have immensely enriched this work and will undoubtedly aid in advancing self-awareness and well-being across all neurotribes. Your voices and experiences are integral to the tapestry of this research, and for this, we are eternally grateful.*

## ACKNOWLEDGMENTS

We wish to express our profound gratitude to the constellation of researchers, colleagues, and professionals who have played a pivotal role in shaping this book. Their expertise and support have been invaluable in navigating the complex realms of neurodiversity, neuroarts, neuroaesthetics, and sensemaking. We are particularly indebted to Drs. Jocelyn Kiss, Colleen Biri, Sara Bagley, Stephanie Afful, and Caitlyn McGinley for their insights and unwavering dedication.

Morgan Harper-Nichols extends a special thanks to the Lindenwood University community for the invaluable mentorship and support provided throughout her academic journey. A heartfelt appreciation goes out to Dr. James Hutson, Dr. Piper Hutson, Ben Fulcher, and Andrew Smith for their guidance and significant impact on her research and academic progression.

We recognize and celebrate the tireless efforts and pioneering work of our fellow researchers in the field, whose studies have significantly informed our work and contributed to a richer understanding of the intersection between neurodiversity and artistic expression. We extend special thanks to the College of Arts and Humanities at Lindenwood University for providing the essential resources and fostering an environment conducive to interdisciplinary research, crucial in uniting the fields of neuroscience, psychology, and the arts.

Our academic peers and mentors deserve our deepest appreciation for their invaluable guidance and insightful critiques, which have sharpened

our perspectives and approaches. Their wisdom has been a beacon of light throughout this endeavor. We also owe a debt of gratitude to the artists and individuals from neurodiverse communities who generously shared their experiences and creations. Their narratives and art have injected authenticity and profound depth into this exploration.

Finally, our heartfelt thanks go to the editorial team and support staff. Their meticulous attention to detail and unwavering commitment have been instrumental in refining this manuscript to its final form. This book stands as a testament to a shared vision and collaborative effort to elucidate the human experience in its rich diversity. We are truly honored to have embarked on this journey with such a dedicated and inspirational group of individuals and organizations.

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## ABOUT THE AUTHORS

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PART I

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# Foundations



## Introduction: The Nexus of Neuroarts, Neuroscience, and Technology

The introduction lays the foundation for understanding how neuroarts—a fusion of neuroscience and art, enhanced by technology—is reshaping creativity. Tracing neuroarts evolution from a novel idea to a significant interdisciplinary field, this chapter delves into the synergy between the brain sciences and artistic expression and how technology can act as a bridge, expanding the boundaries of how we create and perceive art. Central to this discussion is the concept of sensemaking, which involves interpreting and making sense of various sensory experiences. A key focus is on the diverse sensory experiences within neurodiversity, acknowledging how different neurological experiences can influence art. The concept of neurotribes is introduced to stress the importance of recognizing diverse cognitive profiles, especially in the context of neurodiversity, art, and human connection. The chapter explores current research in neuroaesthetics, particularly in relevance to Autism Spectrum Conditions (ASC), shedding light on strength-based approaches to understanding unique artistic perceptions within the Neurodiversity umbrella. It concludes by discussing theoretical frameworks like phenomenology and enactivism, and introduces synesthesia—a condition where sensory experiences are interconnected resulting in a unique sensory perspective and prevalence of individuals preference through an evolution of sensory experiences.

## 1.1 THE BRAIN ON ART

Research continues to reveal the profound effects of art on the human brain, particularly in the context of well-being (Cotter et al., 2023; Mastendrea et al., 2019; Secker et al., 2018). The burgeoning fields of neuroarts and neuroaesthetics, situated at the intersection of neuroscience, art, and technology, are predicated on this very relationship (Magsamen & Ross, 2023). For instance, the act of engaging with art, especially colorful paintings (Fig. 1.1), has been found to significantly enhance mental wellness in certain cases, underscoring the idea that the aesthetic appreciation of art is not merely a passive experience but an active process involving complex neurological pathways (Puranik, 2023). Colorful artwork, whether experienced in person or online, is found to trigger the release of dopamine, a neurotransmitter associated with pleasure and reward. This release leads to feelings of happiness and well-being, akin to the sensations evoked by other pleasurable experiences such as food or sex. These findings suggest a universal response to aesthetic stimuli, underscoring the essential role of art in human life.



**Fig. 1.1** Wassily Kandinsky, *Gelb, Rot, Blau*, 1925 (Source From Wikimedia Commons, licensed under CC0)

The scientific exploration of how the brain responds to art has garnered increasing interest, particularly because the disciplines of art and brain science have historically developed independently. Art history and criticism, grounded in the humanities, have traditionally concentrated on the aesthetic evaluation, cultural importance, and interpretation of art. In contrast, neuroscience has aimed to comprehend the functions and structures of the brain using scientific methods. Zeki (1999, 2007) represents a previous attempt at understanding such reactions, and their research reveals that viewing beautiful paintings can be equivalent to looking at someone we love, activating the same areas of the brain responsible for pleasure sensations. This phenomenon can be attributed to the engagement of brain structures like the orbitofrontal cortex, amygdala, and ventral striatum (Fig. 1.2) when encountering aesthetically pleasing art. At the same time, the influence of art extends beyond mere visual pleasure, contributing significantly to mental and emotional well-being. Engaging with art, particularly vibrant and colorful pieces, has been shown to reduce stress and promote relaxation (Raad et al., 2021; Smyth et al., 2020). Additionally, it can enhance cognitive functions, notably in areas such as memory retention and critical thinking. The practice of art can cultivate mindfulness and aid in sharpening concentration. It is advocated that regular engagement with artistic experiences should be an integral part of a comprehensive approach to well-being. This deep, mindful interaction with art is not only soothing but also instrumental in heightening emotional responses and improving mental health (Windle et al., 2018).

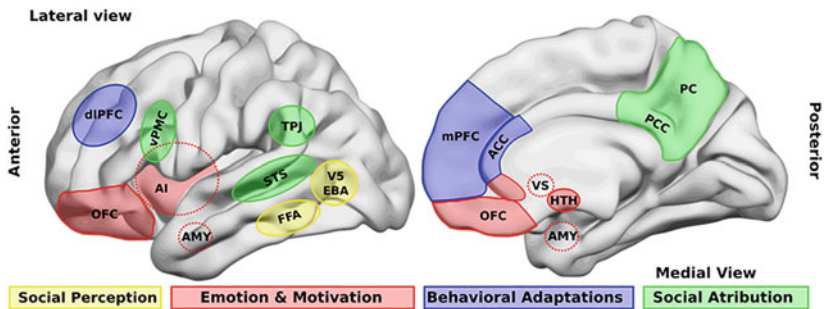


Fig. 1.2 Billeke and Aboitz, brain areas that participate in social processing 2013 (Source From Wikimedia Commons, licensed under CC-3)

Furthermore, art has the capacity to activate the prefrontal cortex, a critical region of the brain involved in focus and interpreting meaning from sensory information. This aspect of the impact art has on the brain underscores its role in cognitive processing and emotional regulation (Bigliassi, 2022). The capacity of art to stimulate the prefrontal cortex—a key area in the brain responsible for focus and deciphering meaning from sensory data—holds particular significance for individuals who are neurodivergent. While processing of sensory stimuli has a range of neurodiverse experiences, these individuals are prone to specific conditions. Neurodiversity as a term reflects the understanding that variations in the neurocognitive functioning of the human brain are a natural and valuable aspect of human diversity (Dwyer, 2022). This concept encompasses a range of neurological differences, viewing them not as deficits, but as normal variations in the human genome. In this context, the term “neurotypical” refers to individuals whose neurocognitive development and functioning are consistent with the societal standard. These individuals typically do not exhibit significant deviations in their neurological processing (Radulski, 2022). In contrast, “neurodivergent” describes those whose neurological development and functioning diverge from this conventional standard. This divergence is not a mark of inferiority, but rather a reflection of the diverse spectrum of human brain functioning. The neurodivergent group includes individuals with various conditions, such as Autism Spectrum Condition (ASC), characterized by distinct social interaction, communication styles, and sensory sensitivities; Attention-Deficit/Hyperactivity Disorder (ADHD), noted for its unique patterns of attention, hyperactivity, and impulsivity; Dyslexia, which primarily impacts reading and language processing; Dyspraxia, affecting motor skill development; and Tourette Syndrome, known for its involuntary tics. Each of these conditions presents its own set of challenges and strengths, contributing to the rich tapestry of human neurodiversity (Hulbig, 2023).

Regarding the prefrontal cortex, which plays a crucial role in executive functions such as planning, decision-making, and social behavior regulation, engagement with art can be particularly beneficial for individuals with neurodivergent conditions. This interaction with art has the potential to enhance these executive functions, offering therapeutic and supportive advantages. To exemplify this, the neuroarts installation in Milan by Google hardware design group, *A Space for Being* (2019), serves as a pertinent example. The exhibit demonstrates how different

sensory environments elicit varied physiological responses, highlighting the significance of being attuned to one's physiological and aesthetic surroundings (Uszerowicz, 2019). In other words, the different installations allow visitors to measure which interiors are best suited for their health and well-being by gaining insights into how their bodies and minds react to different artistic and sensory experiences, emphasizing the importance of understanding and harnessing these responses for enhanced well-being and cognitive engagement. For example, people with autism might process the emotional aspects of art in distinctive ways, which could help them develop a better understanding of emotions and empathy. Likewise, individuals with ADHD may find that the concentrated involvement needed for creating or appreciating art offers a well-organized, yet imaginative, outlet for their energy and thoughts.

Additionally, the exploration of neurodiversity and sensory experiences within the context of neuroarts inherently aligns with the social model of disability. This model posits that disability arises not inherently from an individual's physical or neurological conditions but from the societal barriers and lack of accommodations for these differences (Oliver, 1996). The social model serves as a foundational framework for understanding how neurodiverse conditions, particularly autism, are conceptualized within the broader discourse of inclusion and accessibility in the arts. However, it is also crucial to acknowledge that the social model of disability, while transformative in promoting a shift from medical pathology to social inclusivity, has been the subject of debate. Critics argue that it may oversimplify the complex interplay between biological, psychological, and social factors that contribute to the lived experience of disability (Shakespeare, 2014). Moreover, the model's emphasis on societal change, while vital, does not fully encapsulate the personal narratives and self-perceptions of individuals with disabilities, which can vary widely and encompass a range of attitudes toward their own neurodivergent traits or disabilities (Goodley, 2016). To provide a balanced perspective, it's important to integrate the biopsychosocial model, which recognizes the importance of biological conditions and personal experiences in conjunction with social barriers (Engel, 1977). This model offers a more nuanced understanding of disability, acknowledging that individual experiences of disability are shaped by a combination of genetic, psychological, and social factors.

Furthermore, engagement with the concept of neurodiversity itself requires a critical examination of how diverse neurological conditions are

valued and represented in society. The neurodiversity movement advocates for the acceptance and celebration of neurological differences as natural variations within the human genome, challenging the notion of neurotypicality as the standard (Singer, 1999). Yet, this perspective too invites critical discourse on how best to support individuals with neurodivergent conditions in a manner that respects their autonomy and individual needs while striving for societal accommodation and inclusion. Incorporating these diverse perspectives enriches our understanding of the complex landscape of neurodiversity and disability. It invites ongoing dialogue and research into the ways neuroarts can serve as a medium for expressing, understanding, and navigating the multifaceted experiences of neurodivergent individuals. By embracing a multiplicity of models and viewpoints, the field of neuroarts can contribute to a more inclusive and empathetic society that values and accommodates a spectrum of sensory experiences and neurological conditions.

## 1.2 ART AND HEALTH

While the modern field of neuroarts and the neuroscience underlying the connections between art and well-being can be traced to the late twentieth century, the practices of using art for healing and well-being extend back to antiquity (De'Souza, 2012). In ancient cultures, the therapeutic and transformative power of art was widely recognized. For example, art was deeply embedded in religious and healing practices in ancient Egyptian culture. The Egyptians revered the healing power of visual aesthetics, evident in their elaborate tomb paintings (Fig. 1.3) and sculptures that were believed to ensure a peaceful afterlife and provide protective benefits (Allen, 2005). Similarly, in ancient Rome, healing temples, known as Asclepieia, were richly adorned with art, integrating music, theater, and visual arts as essential components of patient healing regimens (Fig. 1.4) (Burge, 2015). The Greek philosopher Aristotle acknowledged the cathartic impact of drama, particularly tragedy, advocating its emotional purging and healing virtues (Ferrari, 2019). During the Renaissance, a deeper exploration of the relationship between art and health emerged, significantly influenced by the humanist movement. This period highlighted the importance of individuality and holistic well-being with “outward and inward senses” given equal weight, and viewing art as a symbol of balance, harmony, and beauty essential for uplifting the spirit and enhancing mental well-being (Fig. 1.5). Renaissance art,



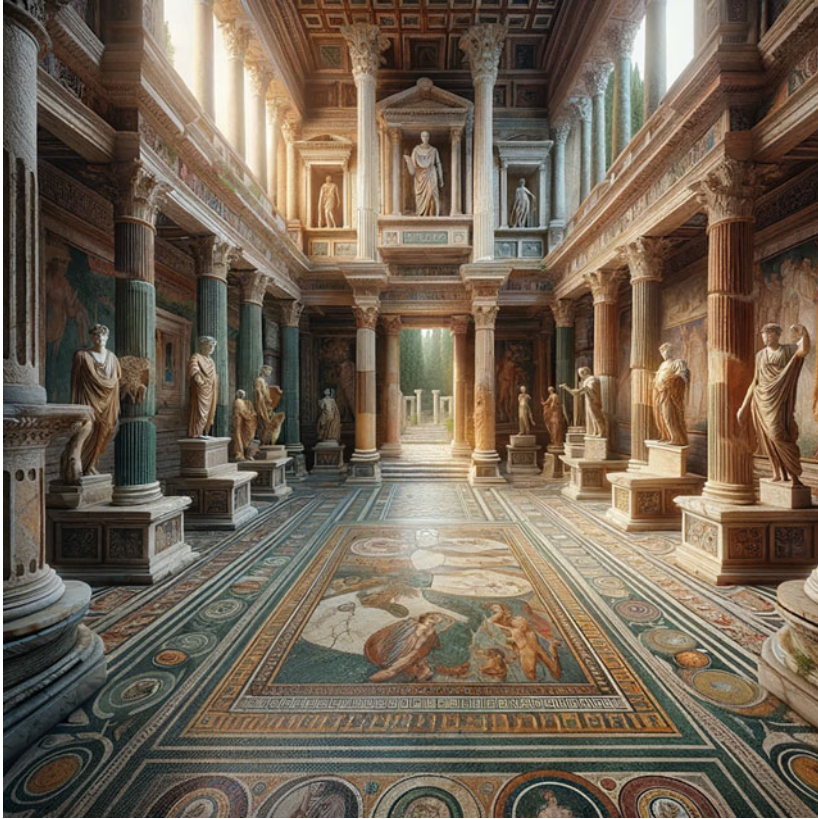


**Fig. 1.3** Egyptian tomb wall-painting—Egyptian collections, vol. XI (1826–1838) (*Source* From Wikimedia Commons, licensed under CC0)

with its detailed portrayal of human emotions and the natural world, was considered a channel for emotional and spiritual enrichment (Thibault, 2019).

Moreover, many indigenous cultures have longstanding traditions of integrating art into healing practices. Native American cultures, for instance, use sand painting in healing ceremonies, where the intricate and symbolic designs are believed to restore balance and harmony (Samuels, 1995). In ancient Chinese culture, the practice of calligraphy (Fig. 1.6) was seen as a meditative and healing exercise, with the careful strokes believed to harmonize one's qi and promote mental tranquility (Zhang & Rose, 2001). On the Indian subcontinent, the traditional art of creating Rangoli (Fig. 1.7), involving intricate floor patterns made with colored powders or rice, was a part of religious and healing rituals, believed to bring good fortune and health (Surapaneni, 2023). Additionally, Aboriginal Australian art, known for its intricate dot paintings (Fig. 1.8) depicting sacred stories and rituals, has been used for thousands of years as a tool for spiritual healing and connection to the land and ancestry (Bennett, 2023). This historical perspective illustrates that the intersection of art and well-being, now increasingly illuminated through the lens of neuroscience, is deeply rooted in centuries of human culture, philosophy, and diverse global traditions.

The advancement of cognitive psychology and neuroscience has established new frameworks for comprehending the brain's information processing mechanisms, encompassing both perceptual and emotional responses. This significant shift in perspective has enabled a more detailed



**Fig. 1.4** Recreation of Ancient Roman Aesclepieia, 2023 (*Source* Permission by authors)

investigation into the brain's perception and interpretation of art, effectively merging psychological theories with neurological findings. With the experience of visual art being associated with health benefits firmly rooted in culture, there is little surprise that it is now being prescribed by medical professionals and psychologists to treat a range of ailments. The contemporary concept of "Arts on Prescription," described by Golden (2023) represents a continuation of this tradition of leveraging the healing power of art, though innovative for mental healthcare. In the 1940s, one of the first acknowledgments of art's therapeutic benefits in a medical

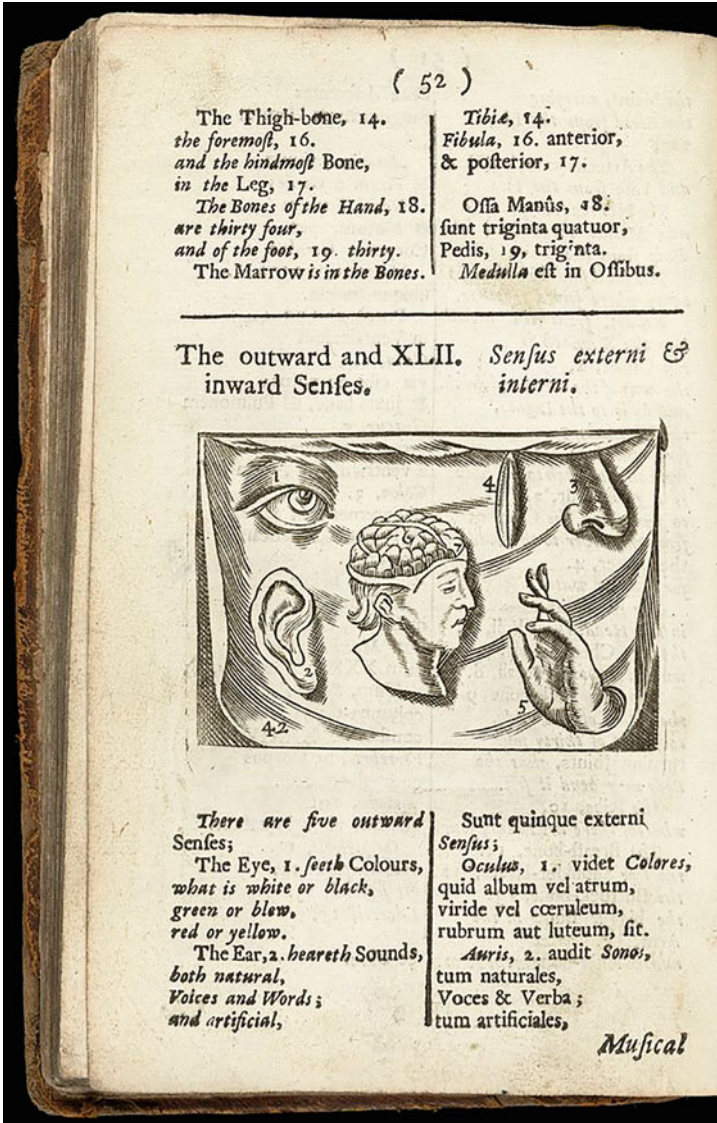


Fig. 1.5 The outward and inward senses. John Amos Comenius, *Visible world: or, a nomenclature, and pictures, of all the chief things that are in the world, and of men's employments therein*. 1728 edition (Source From Wikimedia Commons, licensed under CC-BY 4.0)



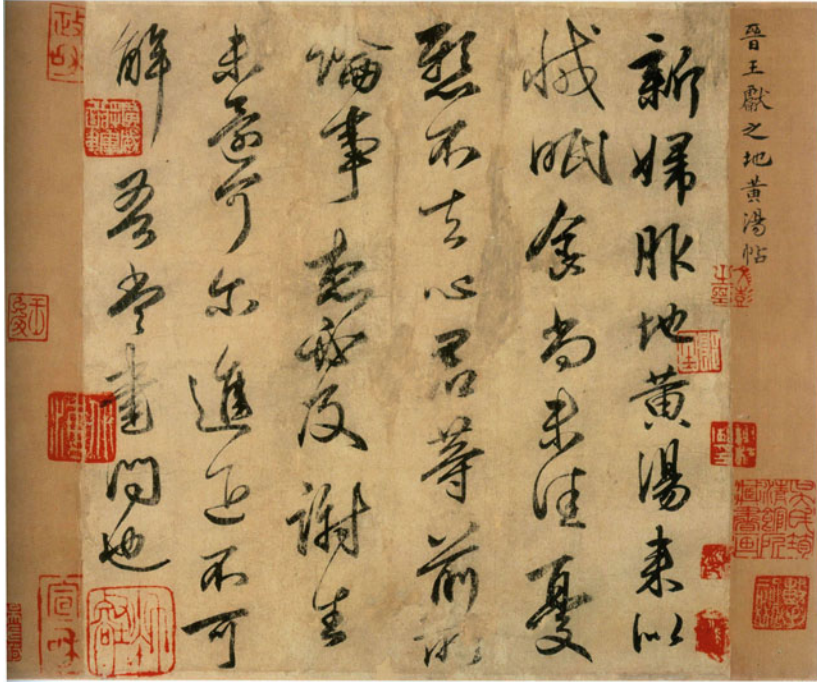


Fig. 1.6 Wang Xianzi imitation by Tang Dynasty (Source From Wikimedia Commons, licensed under CC0)

context is linked to Dr. Adrian Hill (1895–1977), a British artist. While recuperating from tuberculosis, Hill experienced firsthand the therapeutic effects of art and began integrating it into patient care. He introduced the term “art therapy” in 1942, marking a significant step in recognizing art’s healing potential, particularly in hospitals. His work laid the foundation for establishing art therapy as a formal field (Chapin & Fish, 2016). Simultaneously in the United States, Margaret Naumburg (1890–1983), often hailed as the “mother of art therapy,” championed the use of art as a psychotherapeutic expression tool. She underscored the value of art in articulating the unconscious mind, employing it therapeutically with children and adolescents in psychiatric settings. Her advocacy and application of art in psychotherapy contributed significantly to the development and recognition of its therapeutic benefits (Junge, 2015).



**Fig. 1.7** Flower Rangoli Chennai (*Source* From Wikimedia Commons, licensed under CC0)

The model of social prescribing, integral to this approach, allows healthcare providers to refer patients to local arts and cultural resources, alongside traditional treatments. By addressing the broader social drivers of health, this model expands the conventional healthcare paradigm. The concept, having roots in the United Kingdom, has evolved to encompass a variety of services, including arts, which have shown significant benefits in reducing anxiety and depression, and improving the quality of life. In the United States, initiatives like the CultureRx: Social Prescription Pilot in Massachusetts demonstrate the practical application of the model, with healthcare professionals prescribing cultural activities as part of patient care (Golden et al., 2023). Arts on prescription not only broadens the scope of resources for healthcare providers but also emphasizes the necessity for equitable access to arts and cultural activities. Providing a range of artistic mediums accommodates different interests and skill sets. For instance, those facing challenges with fine motor skills might find activities like painting or sculpting more suitable, whereas individuals with dyslexia may lean toward visual arts rather than literary forms. Additionally, for