

Commentary

Our Brains on Art: An Ancient Prescription for 21st Century Solutions

Susan Magsamen

Johns Hopkins University, School of Medicine, Baltimore, Maryland 21205

Have you ever experienced the awakening presence of a loved one with dementia as they sing a familiar song? Or watched, in awe, as the tremors of a person with Parkinson's disease stop and the person's gait improves as they dance? Have you wondered why, exactly, you feel so moved when you hear a piece of music? Or why digging in a garden or walking through a beautiful natural vista brings a sense of calm? Or why drawing, coloring, or doodling for just a few minutes can help relieve anxiety and stress? Have you felt the physiologically calming effects of a poem read on a day when you were inconsolable?

In writing the book *Your Brain on Art: How the Arts Transform Us* (Magsamen and Ross, 2023), my coauthor Ivy Ross, chief design officer of consumer devices for Google, and I sought to illuminate the power of the arts and aesthetic experiences. We wove together the emerging science of neuroaesthetics to illustrate how creative expression advances our health, well-being, and learning, and how this mode, which is available to us all, is poised to shape the future of medicine, public health, and education. After just 6 d, our book became a *New York Times* bestseller. Over the last year, thousands of people have told us that the book validates their art experiences; that it has given them permission to make art again; and that it has put into words what they already knew intuitively. I believe the book has been so successful because the world is hungry for ways to heal, thrive, and flourish. Ironically, these solutions have been with us all along, since humanity began. Science is finally catching up and offering a new world of possibilities to translate

cutting-edge research into practice around the globe.

The arts are the language of humanity—our deepest and among our earliest forms of complex communication and connection. Evolutionary Biologist E.O. Wilson argued that without the arts, humanity could not have evolved as the thinking, feeling creatures we are. From the beginning of time, we have been storytellers, making meaning out of our daily lives. Consider the wall paintings in Bulgaria's Magura Cave that depict religious ceremonies, hunting scenes, and deities unique to the Balkan peninsula. These paintings have been dated to between 8,000 and 10,000 years old, and one grouping may even show and describe a solar calendar (Stoev and Maglova, 2015).

Around 2020, David Zhang of China's Guangzhou University led a team of geologists high into the Tibetan Tableau, where they found a piece of soft travertine that bore a composition of hand and foot imprints. They later dated the impressions to an astounding 226,000 years ago, making their find possibly the oldest representation of art discovered to date (Zhang et al., 2021). If we look closely, we can observe that the artwork is a symbolic representation of hands, the very tools we use to create our world today. Over thousands of years, the gatherings and ceremonies captured by these and other ancient works of art have evolved into the incredibly diverse array of cultures that span our globe. The arts create culture; culture creates community; and community creates humanity.

Arts and aesthetic experiences come in many forms. There are the visual, literary, media, and performing arts; music and sound; dance and movement; architecture and design; and craft. There are the culinary arts, where food is more than mere nourishment, and there is nature, which is the ultimate human aesthetic experience. Humans cannot help but continue

to innovate and add to the list of creative expressions with each generation. Just think of things like virtual reality and digital art which did not exist until recently, and imagine what new and extraordinary forms of creative expression we will have in the future. It is easy to envision the vast range of arts and aesthetics as a new form of periodic table with limitless combinations and possibilities.

From sages and shamans to philosophers and poets, over the millennia many have sought to understand the power of the arts. But within a short span of <30 years, significant advances in technology have allowed us to peer noninvasively into the brain and gain a better understanding of its biochemistry, structure, and function and have begun to reveal what happens when we participate in the arts and aesthetic experiences. Scientists are now better able to explain what artists have known intuitively for years—we are wired for the arts.

While the science of the arts is called neuroaesthetics, the emerging global field is called neuroarts. Together, they deepen our understanding of how the arts and aesthetic experiences measurably change the body, brain, and behavior—and how this knowledge is translated into specific practices that advance health and well-being. This emerging field is highly collaborative and consists of diverse stakeholders in research, practice, policy, training, capacity building, and more, weaving together the arts, health, science, and technology.

Some enter the field through the sciences, including neuroscience, neurology, physiology, and cognitive neuroscience research. Others come from the social and health sciences including public health, psychology, implementation science, engineering, and computer sciences. At the center of the field are the artists and arts practitioners whose experience fuels our understanding.

The field is driving a cultural shift toward a future in which the arts can

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Correspondence should be addressed to Susan Magsamen at smagsam1@jhmi.edu.

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deliver potent, accessible, proven health, and well-being solutions to billions of people. There is a palpable worldwide movement that is accelerating at a rapid and exciting speed, impacting literally every sector in society. Despite this momentum, policy and funding is needed to create a sustainable field that has yet to be realized.

We are witnessing an incredible moment in history, where the arts and aesthetic experiences are primed to offer new solutions to the complex problems of our times. Arts and aesthetic practices are being used in healthcare, rehabilitation, education, cultural organizations, community centers, and public health. The military, through its initiative Creative Forces (Creative Forces: NEA Military Healing Arts Network), is using visual arts, music, and dance interventions to help soldiers and their families more fully recover from PTSD and traumatic brain injuries (National Endowment for the Arts, n.d.). Businesses are engaging architects to design buildings and work environments that spark creativity and innovation. Composers are writing music that activates the relaxation response and creative flow states. Singing is being used to ease postpartum depression and foster bonding between newborns and their mothers (Warran et al., 2023). Communities are learning about social prescribing and arts-on-prescription: efforts that connect people to arts activities to improve health outcomes. Some school systems are not only integrating the arts into math and science classes to enhance learning but also using art as a tool to reduce trauma and stress while increasing focus and attention.

Global action and interest surrounding the use of the arts for healing, learning, and resiliency has always been strong. But over the last decade in particular, the understanding of the role that arts and aesthetic experiences play in the service of humanity has grown among scientists and clinicians, artists, community leaders, and government officials. That has led to the expansion of rigorous research through public and private support to further strengthen the evidence base for this paradigm-shifting work. The arts are emerging as a standalone treatment, as well as complementary to traditional evidence-based practices. And research is demonstrating that you do not have to be talented, gifted, or proficient at the arts for them to provide you significant benefits. The implications for humanity are immense.

Researchers are now connecting the mechanistic underpinning of the arts

to a variety of outcomes. For example, singing or listening to music can help Alzheimer's/dementia patients to improve behavior and quality of life, even in the later stages (Sung et al., 2010). Dancing is good for you, in general, and there are nearly 40 peer-reviewed papers that show the benefits of dance for people with Parkinson's disease: improving gait, mood, sleep, and cognition (Hwang and Braun, 2015). Recharge rooms, which are restorative spaces, are popping up in cities around the world, healthcare settings, libraries, and community centers, to lower stress and reduce burnout (Putrino et al., 2020). Immersive video games are being created to assist with chronic pain, ADHD, stroke, and more, by literally rewiring the brain (Goudman et al., 2022). First responders are using the arts to address PTSD, as well as ongoing stress and anxiety (Matto and Sullivan, 2021). Individuals in the justice system are using mural painting, woodworking, theater, expressive writing, and other arts to enhance and improve their mental health.

In the United States, the National Institutes of Health (NIH) has been at the forefront of building rigorous evidence-based research in the arts. Their efforts validate that the arts simultaneously alter a complex physiological network of interconnected neurological and biological systems from respiratory and circulatory systems to immune and muscular systems. NIH-funded research has yielded a number of seminal publications, among them a paper summarizing recommendations from the NIH/Kennedy Center "Workshop on Music and the Brain" in 2017 (Cheever et al., 2018). This workshop marked one of the first events of a collaborative effort, the Sound Health Initiative, which is led by Dr. Francis Collins, former NIH director and a gifted musician; Dr. Emmeline Edwards, director of extramural research at NCCIH/NIH; Dr. Melinda Kelley, associate director for scientific strategy at NIA/NIH; Renée Fleming, internationally renowned soprano and arts advocate; Deborah Rutter, president of the Kennedy Center for the Performing Arts; and Sunil Iyengar, director of research and analysis at the National Endowment for the Arts (NEA).

The NIH and Sound Health Initiative have yielded important foundational music-based intervention standards critical for the growth of the entire neuroarts field. Through the National Center for Complementary and Integrative Health (NCCIH), a Music-Based Intervention Toolkit has been developed for rigorous

interdisciplinary clinical studies for brain disorders of aging (Edwards et al., 2023), along with a series of papers to strengthen evidence-based research including "Music and Brain Circuitry: Strategies for Strengthening Evidence-Based Research for Music-Based Interventions" (Chen et al., 2022) and "Music as Medicine: The Science and Clinical Practice" (Chen et al., 2024). Research grants have been awarded to study a range of interventions for older adults, individuals with autism, and those with neurodegenerative disorders (Benson et al., 2024; Faber et al., 2024; Fleszar-Pavlovic et al., 2024; Tueth et al., 2024; Fram et al., 2024).

Four music-based research networks have also been established to promote multidisciplinary mechanistic studies of music-based interventions (MBIs) for pain or Alzheimer's disease. These networks are charged to develop compelling research frameworks to guide future clinical studies on MBIs in these health conditions, adopt consistent terminology and taxonomy, support interdisciplinary collaborations, and initiate pilot projects to test novel mechanistic hypotheses and identify strong mechanistic measures, outcomes, biomarkers, novel technologies, and methodologies with the goal of enabling investigators to develop preliminary data to support later applications to NIH for larger-scale research. They include Research Network to Accelerate Mechanistic Studies of Music for Dementia (RN-MusD), Music4Pain Network, Effective Network to Advance Scientific Evidence related to Mechanisms of music-Based interventions (ENSEMBLE), and Music Mechanisms and Technologies Network (MMTN). The NIH also funds training and career development awards to students and early stage investigators working in the music and health field.

Importantly, the frameworks established for music-based research through the Sound Health Initiative and others are forming the baseline standards for other art modalities and are informing the field on how rigorous research can be applied across multiple art and aesthetic modalities and conditions. In total, ~40 million dollars in funding over the past 5 years has been committed to music-based research. While an impressive financial commitment, significantly more public and private resources are required to spark groundbreaking advances across all art modalities.

This burst of global interest in arts and aesthetic experiences and how they impact our physical and mental well-being has been fueled by the academic and public

sectors. In 2007, through the vision of an extraordinary philanthropic family, I founded the International Arts + Mind Lab Center for Applied Neuroaesthetics (IAM Lab) at the Johns Hopkins School of Medicine. Our goal is to amplify human potential through building the discipline of neuroaesthetics; coalesce and support a global community through the field of neuroarts; and design and test a generative translational approach.

The IAM Lab focuses on four core areas: research, field leadership, community building, and outreach and education. We are part of a growing global network of initiatives that seek to better understand the research about how the arts can promote health and well-being. For example, the World Health Organization (WHO) is leading a series of global activities around the world focusing on the power of the arts and health.

Initiatives like the WHO gatherings and others key convenings have laid the foundational collaborations and connections that are shaping the field across multiple public and private sectors. For example, in November 2023, the IAM Lab held the first intentional-spaces gathering, “Bridging Research, Architecture, and Design for Health and Wellbeing.” The 2-day conference convened 300 global leaders who shared their thoughts and experiences on the state of design and architecture with the goal of creating a strategy for the field.

To better coalesce this nascent neuroarts field and build field leadership, the IAM Lab began a partnership with the Aspen Institute in 2019 to take the pulse of the community. That resulted in the *NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing* (NeuroArts Blueprint, 2021). The Blueprint is a global initiative with the goal of ensuring that the arts and the use of the arts—in all their many forms—become part of mainstream medicine and public health. As we were formulating the Blueprint, we found, not surprisingly, that there was amazing work happening all over the world, and the neuroarts field was ripe for growth. Also not surprisingly, we learned that there is very little policy, sustainable funding, or institutional support available in the United States or other nations to support neuroarts research and practice.

The NeuroArts Blueprint puts forth five recommendations that have been translated into action steps for an implementation plan to build the field. The first recommendation is to strengthen the

research foundation of neuroarts. The second is to honor and support the many arts practices that promote health and well-being. The third is to expand and enrich educational and career pathways. The fourth is to advocate for sustainable funding and promote effective policy. And finally, it is to build capacity, leadership, and communications strategies.

Central to the implementation plan is the development of the Neuroarts Resource Center, an engine for driving dissemination of research, practice, and ideas for the Blueprint. This interactive and continually updated platform, to be launched in January 2025, provides the infrastructure required to access global neuroarts-related research, clinical findings, and arts and community practices. It will be the go-to resource for the neuroarts community to learn, connect, share knowledge, be inspired, and inspire.

At the heart of our recommendations is a laser focus on developing robust evidence through groundbreaking research. The work of interdisciplinary teams—and in particular the next generation of practitioners and scientists—is key to propelling the field. The Blueprint Scientific Advisory Board (BSAB) is developing a foundational research agenda that draws from community needs and experiences, overlaid with basic, translational, and clinical research. This will ultimately include the development of an Arts Brain Map, a tool that will provide new knowledge about how arts and aesthetic experiences impact brain mechanisms, structure, and function. To foster this pipeline of neuroarts investigators, the Blueprint partnered with Renée Fleming and her foundation to create the Renée Fleming Neuroarts Investigator Awards in 2023. In early 2024, we awarded seven early-career grants to support projects on topics ranging from hip-hop music to neuroarchitecture.

Our focus on evidence includes economic analyses of how neuroarts can generate meaningful economic benefits. With our partners at AARP, the Neuroarts Blueprint has commissioned two economic analyses of how engaging with music can ease the symptoms of Alzheimer’s, to learn the comprehensive true value and quality-of-life impact on both the patient and the caregiver. These two analyses form a template for studying other arts-based interventions and populations with other health challenges. This work may be a game changer for advancing the field, by demonstrating that evidence-based arts interventions are a good value for public and private payers (KPMG, 2021).

Further building on the recommendations, the Blueprint has launched Community Neuroarts Coalitions (CNCs). These hyper-local community-driven networks are enhancing capacity and fostering a global community of diverse stakeholders committed to strengthening their communities through neuroarts. Currently there are three CNCs in cities across the United States, and the Blueprint is launching a field guide and offering technical assistance to respond to the hundreds of communities around the world that are seeking to establish CNCs. Additionally, the Academic and Educational Advisory Network, which is under development, will expand and enrich educational and career pathways for students, ensuring the next generation of leaders is well equipped to further the field by supporting ongoing training and professional development.

To build stronger relationships within the field and to codevelop advocacy efforts and shared language, the NeuroArts Blueprint has convened The Bright Eyes Coalition, a broad cross section of organizations who believe that the arts are essential for our individual and societal health, well-being, and learning. The group takes its name from a pediatrician’s observation that children who had been exposed to art had “a brightness in their eyes that signaled prospects for good health.” Representatives from diverse organizations, including AARP, Americans for the Arts, National League of Cities, and the National Organization for Arts and Health, have gathered to strengthen collective impact toward ensuring arts, culture, and aesthetic experiences are part of mainstream medicine, addressing health and well-being.

Neuroarts is the true marriage of arts and sciences. The time is now to build a field where researchers, artists and arts practitioners, policy makers, and funders can work together to develop new solutions to improve our health and well-being. People from all disciplines are coming together to join the neuroarts community. All are welcome.

The result: A strong and vibrant interdisciplinary field that honors science, artistic experience, and practices, meeting the challenges and opportunities of a complex world.

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