

Executive Summary
and NeuroArts Blueprint

NeuroArts Blueprint

Advancing the Science of
Arts, Health, and Wellbeing

HEALTH, MEDICINE
& SOCIETY PROGRAM

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About the NeuroArts Blueprint Initiative

The *NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing* initiative is breaking new ground at the crossroads of science, the arts, and technology. Its mission is to cultivate an ecosystem for neuroarts, defined here as the transdisciplinary and extradisciplinary study 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 wellbeing.

To realize its potential, neuroarts must become a fully recognized field of research and practice, with educational and training pathways, dedicated funding, supportive public sector and private sector policies, effective leadership, well-crafted communications strategies, and infrastructure capacity. The *Blueprint* initiative is designed to put all of that in place. A partnership between the [Johns Hopkins International Arts + Mind Lab Center for Applied Neuroaesthetics](#) and the [Aspen Institute's Health, Medicine & Society Program](#), the initiative engages leaders across a wide range of disciplines, as well as people with lived experience. Together, they are helping to drive the paradigm shift necessary to fully integrate arts and aesthetic experiences into activities that will advance individual and collective health across the planet.

More details are available at this [website](#).

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JOHNS HOPKINS
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NEUROAESTHETICS

At the core of being human, the arts are a vibrant path to health, community, and possibility.



NeuroArts Blueprint

Advancing the Science of Arts, Health, and Wellbeing



PRESIDENTS' LETTER

December 2021

We are delighted to release the *NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing*. Here you will find a roadmap to the future, building on the rigorous research and innovative practices that are already elevating the arts as a health-promoting tool for individuals and communities.

Scientific studies over the last 20 years are confirming what artists have always known intuitively: the arts can help in preventing, managing, and recovering from physical and mental health challenges; building more equitable communities; and fostering wellbeing through multiple biological systems. But to realize the full potential of these connections, we must cultivate a neuroarts ecosystem that brings together a diverse set of researchers, arts practitioners, artists, technology pioneers, local advocates, educators, funders, policymakers, and other stakeholders. The *NeuroArts Blueprint* is the action plan to make that happen.

This report is the result of an ambitious partnership between our two institutions, and we are proud to have supported this effort. The International Arts + Mind Lab Center for Applied Neuroaesthetics at Johns Hopkins is a multidisciplinary translation research-to-practice initiative that brings together brain scientists and arts practitioners to accelerate the field of neuroaesthetics, with the goal of amplifying human potential through the arts and aesthetic experiences. The Aspen Institute has a long-standing commitment to using both science and art as tools for building a just and equitable society. The Institute's Health, Medicine & Society program has earned a stellar reputation for convening influential groups of thought leaders, decision-makers, and the informed public to consider 21st-century health challenges and identify practical solutions for addressing them.

Many collaborators must work together to bring a report like this to fruition, and we owe all of them our appreciation. In particular, thanks are due to the cochairs of the Advisory Council: the renowned soprano Renée Fleming; Eric Nestler, who directs the Friedman Brain Institute at the Icahn School of Medicine, Mt. Sinai Health Center; Mike Paseornek, producer and former president of Motion Picture Production at Lionsgate; and Anna Deavere Smith, actress extraordinaire. We are grateful to them, and to all of the Advisory Council members who have given so generously of their time and insights to build this neuroarts framework.

This *Blueprint* is, of course, only the beginning of a long and important journey. Driven forward with intention, and particularly with a commitment to engaging *all* communities in the development and application of the neuroarts field, we believe this journey will truly be transformative for humankind.

Ron Daniels
President, Johns Hopkins University

Dan Porterfield
President and Chief Executive Officer, The Aspen Institute

NeuroArts Blueprint

Advancing the Science of Arts, Health, and Wellbeing



LETTER FROM COCHAIRS

December 2021

Welcome to the *NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing*. We are so excited to be launching this action plan to strengthen, formalize, and propel the emerging field of neuroarts and connect stakeholders across a vast and disparate landscape into a cohesive ecosystem.

In this report, you will learn a great deal about what is already happening in neuroarts—the many ways in which the scientific evidence documenting the role of arts and aesthetic experiences is transforming health and wellbeing for individuals and communities. You will also learn why the many advances need to coalesce into a robust transdisciplinary—indeed, extradisciplinary—field. Too much of the work currently underway in neuroarts is fragmented, a significant impediment to realizing its full potential. The time has come to bring together all of the stakeholders to implement a systematic and comprehensive plan for moving forward.

Our thanks go to the many partners who have brought us to this moment. We are indebted to AARP, the Aspen Institute, the Civil Society Institute, the Dana Foundation, the Ford Foundation, and Johns Hopkins University, all of which provided early support for this work. We are also extremely fortunate to have so many supportive members on our Advisory Council; their insights have been indispensable in building a foundation for neuroarts.

Thanks as well to project directors Susan Magsamen, executive director of the International Arts + Mind Lab Center for Applied Neuroaesthetics at Johns Hopkins, and Ruth J. Katz, executive director of the Aspen Institute's Health, Medicine & Society program, who bring vision and determination to this initiative. Their small but mighty team—Andrea Camp, Karyn Feiden, Samuel Garrett, Raven Tucker, and Katya Wanzer—have worked tirelessly to advance this initiative.

This *Blueprint* includes the Executive Summary and a full report. The Executive Summary provides a rich overview of what is happening now in neuroarts; identifies diversity, equity, and inclusion as imperatives for cultivating the field; and offers core principles, findings, recommendations, and action steps on which to build. The full report follows, exploring all of that in much more detail. A separate Appendix includes four key research documents that helped to inform the *Blueprint*.

Thanks for taking a deep dive into this work and becoming part of the neuroarts ecosystem.

Renée Fleming

Eric Nestler

Mike Paseornek

Anna Deavere Smith

Cochairs of the NeuroArts Blueprint Advisory Council

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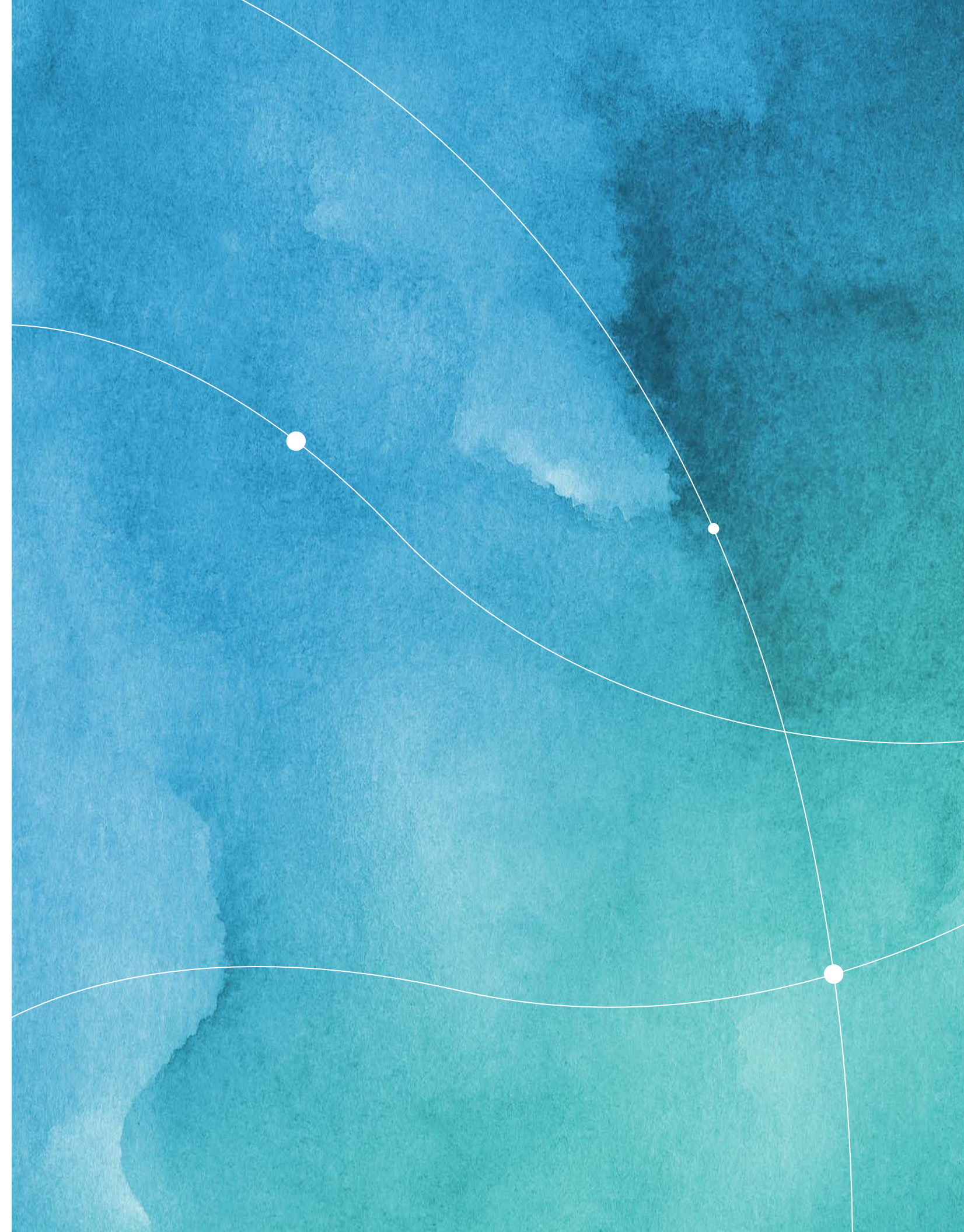
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NeuroArts Blueprint

Advancing the Science of
Arts, Health, and Wellbeing



Overview

Scientific studies increasingly confirm what human beings across cultures and throughout time have long recognized: we are wired for art. The arts in all of their modalities can improve our physical and mental health; amplify our ability to prevent, manage, or recover from disease challenges; enhance brain development in children; build more equitable communities; and foster wellbeing through multiple biological systems.

Most of us do not need rigorous research to recognize that arts and aesthetic experiences allow us to feel better; our own life experiences tell us that engaging with art, either as maker or user, can help us thrive. Why, then, have we developed the *NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing*, a broad-reaching initiative designed to showcase the scientific evidence that explains these phenomena?

The answer is that we have not developed the systems and strategies to use the extraordinary asset that is at our disposal to its fullest potential. We need a *Blueprint* to guide us through the vast body of knowledge that is accumulating across multiple disciplines, to identify collaborative opportunities to collect many kinds of evidence, and to employ these learnings in systematic and sustainable ways so that we can ease some of the most intractable problems that humanity faces. Consider the possibilities:

- What if music helps people recover from depression and improves memory in those with Alzheimer's disease?
- What if movement and dance reduce the symptoms of Parkinson's disease?
- What if virtual reality allows people with physical disabilities to become more mobile?
- What if watching a theatrical performance lessens the toll of chronic illness or reduces the anxiety of palliative care?
- What if drawing bolsters social and emotional wellbeing in a child?
- What if the visual arts are an effective treatment for posttraumatic stress disorder (PTSD) and traumatic brain injury?
- What if community arts activities can reduce isolation and increase wellbeing?

- What if creating art helps people with autism and other intellectual disabilities build social and occupational skills?
- What if the arts can relieve burnout in healthcare and frontline workers?
- What if play-acting provides a pathway for clinicians to recognize their unintentional racial biases and change practice?
- What if building design improves the mental health of those working inside?

In fact, science is proving that the arts and aesthetic experiences can do all of that and more. The *NeuroArts Blueprint* offers a roadmap for translating those findings into asset-based action.

The *Blueprint* is a partnership between the Johns Hopkins International Arts + Mind Lab: The Center for Applied Neuroaesthetics (IAM Lab) and the Aspen Institute’s Health, Medicine & Society Program (HMS). To inform our work, we assembled a diverse 25-member Advisory Council; conducted in-depth literature reviews and analyses ([NeuroArts Today: State of an Emerging Field](#)); held eight stakeholder convenings to explore communications, policy, practice, research, and technology, including two with a global focus; commissioned and published an economic analysis ([Alzheimer’s Disease and Music Engagement Economic Impact Analysis](#)) and a 300-person survey of neuroarts stakeholders ([Findings from an Online Survey of Stakeholders](#)); published a World Bank report that linked art to economic development ([Human Capital and the Arts at the World Bank Group](#)); and exchanged ideas with hundreds of other experts and stakeholders. See the [Appendix](#) for *NeuroArts Today*, the full economic analysis and survey reports, and the World Bank report (NeuroArts Blueprint Initiative 2021a).

This initiative conceives of neuroarts as an ever-evolving ecosystem with many interdependent strands woven into an inclusive community. To foster a collective intelligence, equity must be at the core of the nascent field—a nonnegotiable commitment to dedicating the tools and sharing the power of the arts with all populations and in every community across culture, racial and ethnic background, socioeconomic status, skill set, and more. Bold systemic changes will be needed to further the momentum for neuroarts, steps that must be taken with intention and a willingness to shake up the status quo. By insisting that stakeholders come together on a level playing field, the *Blueprint* recognizes that traditional hierarchies have too often downplayed the knowledge birthed from lived experience and that agents of change dwell not only in academic centers and policymaking circles but also in the communities where neuroarts is used in service to greater health.



Neuroarts is defined in this *Blueprint* as the transdisciplinary and extradisciplinary study 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 wellbeing. As used here **aesthetic experiences** are the feelings, emotions, and perceptions that derive from any art modality.

The **neuroarts ecosystem** (also referred to as the **neuroarts field**) provides the robust framework in which stakeholders with diverse backgrounds, training, and experience can direct their collective power to improving the health and wellbeing of individuals and communities.

Diversity, equity, and inclusion are central to the development of neuroarts and must be woven into every recommendation and action step in this *Blueprint* to achieve success.

Drawing on input from around the globe, the *Blueprint* lays out a collaborative action plan to cultivate the field and ultimately to change the paradigm about how health and wellbeing are achieved. Full implementation of our [core principles, findings, and recommendations](#), summarized below, is a strategic process. In the first five years, we will measure success by the extent to which we assemble the elements of an interdependent, fully operational ecosystem. The foundational elements include a defined community of stakeholders, an established theory of change, shared language, agreed-upon outcome measures, and a well-defined mission. Effective framing, messaging, and communications are also fundamental to coalescing the field.

As more transdisciplinary research flows through the pipeline and evidence-based pilot programs are scaled, the synergies between science and practice will inform an ever-more-solid ecosystem. Over time, the increased understanding and use of the arts and aesthetic experiences to drive health and wellbeing should evolve into a mature field. To become sustainable, neuroarts must align the incentives that foster institutional commitments—from governments, across global organizations, among scientific and arts bodies, and in academic, workplace, healthcare, and community settings. Other long-term imperatives include dedicated funding; educational and career pathways that produce a diverse, well-trained workforce; and public and private policies that accommodate structural change.

As we pursue the promise of neuroarts, this roadmap recognizes and honors the accomplishments of the leaders and pioneers—scientists, arts practitioners, artists, and community knowledge keepers—who are already deeply engaged in this space. We are guided by their knowledge, experience, wisdom, and accomplishments.





Now Is the Moment for NeuroArts

The evidence-based field of neuroarts is not only *transdisciplinary*, meaning that it brings differing disciplines together, but also *extradisciplinary*, bringing in knowledge keepers outside traditional disciplines, including the local people who know so much about the assets and challenges of their own communities. By drawing on team science, research-to-practice strategies, and breakthrough technologies, we can enrich our knowledge of the complex ways in which the arts and aesthetic experiences impact the brain and body. That, in turn, enables us to hone and scale promising clinical and community interventions that serve the needs articulated by those who will use them.

As robust, empirical evidence and innovative practice join forces, they become part of the neuroarts ecosystem, which ties together a network of transdisciplinary—and extradisciplinary—stakeholders. Their collective power can ease some of the most pressing health problems the planet faces and lay the foundation for wellness.

Today, we can study many of the physiological and psychological processes triggered by the arts and aesthetic experiences as never before. Noninvasive ways to see inside the body—including cutting-edge imaging systems, wearable biomarker sensors, and other advanced tools—provide the means to trace and measure our sensory and motor responses, opening up remarkable information-gathering pathways.

New data allow us to characterize the complex biological relationships among genes, the brain, and behavior, spawning still more innovation. As evidence accumulates, our capacity to translate that knowledge to clinical and community practice continues to grow. At the same time, ever-greater computational capacity allows large data sets to be analyzed, interventions tailored to individual biology, evaluative research conducted to assess impact, and effective approaches broadly disseminated.

Allied with the growing research base, an army of arts practitioners is drawing on an arsenal of modalities to advance health and wellbeing. Validated by

a combination of professional experiences and quantitative and qualitative evidence, practitioners are using arts interventions to improve mobility, memory, and speech; relieve pain and the after-effects of trauma; ease the course of chronic and degenerative diseases; enhance learning outcomes; build resilience; lessen the stigma associated with mental health disorders; and address other challenges that sometimes seem intractable (*Arts and Health* 2009–2021; See Me Scotland 2020; University of Florida Center for Arts in Medicine 2021; World Health Organization 2019).

Beyond their capacity to lessen the toll of discrete medical conditions, the arts are playing a somewhat less easily measured—but no less crucial—role in advancing wellbeing, fostering social cohesion, and forging the more equitable, resilient, and economically viable communities that can grow and sustain health (Biondo, Vakis, & Dalton 2020; Center for Active Design 2021; Center for Health Design 2021; Metris Arts Consulting 2021; National Assembly of State Arts Agencies 2017; Rose, Daniel, & Liu 2017; Sonke, Golden, Francois, Hand, et al. 2019). By showcasing and supporting coherent, culturally distinct communities, the arts provide ingredients that are vital for collective health.

Neuroarts offers health-generating, asset-based tools that build on the resourcefulness, determination, and innovation embedded in communities.

The arts have also demonstrated their capacity to enhance social, emotional, and cognitive learning and brain development in early childhood (Goldstein, Lerner, & Winner 2017; Menzer 2015). While the trajectory from engaging with the arts to enhancing early development to health and wellness that endures across the lifespan requires further study, bolstering biological systems at a young age could be a linchpin in the long-running pursuit of healthier populations.

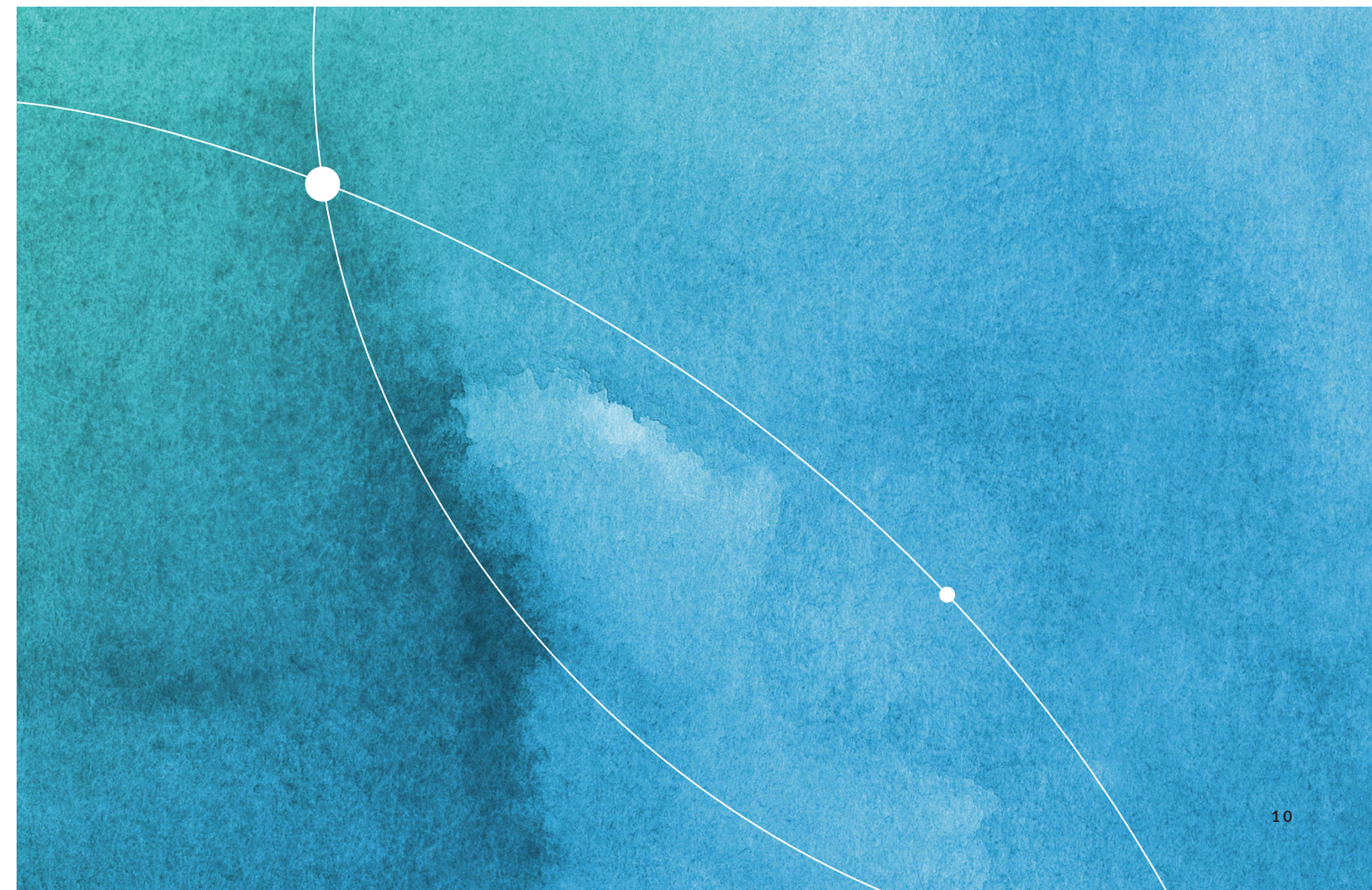
Additionally, the economic analysis conducted by KPMG for this initiative suggests a compelling business case. A conservative analysis concluded that if 30 percent of the population with Alzheimer’s disease has the opportunity for music engagement, it would contribute \$830 million to GDP, sustain 7,784 jobs across the United States, generate \$369 million in labor income, and produce \$126 million in government tax revenues (KPMG 2021).

What is needed now is a structure that brings research and practice together, in service to health and wellbeing, with individuals and community members integral to the field development process. The opportunity is clear. A neuroarts ecosystem, with all of its interconnected components, provides the impetus for a much more rapid scale-up of what is already happening in scattered sites globally. We could then have a scientist studying the impact of a peer drama

program on brain activity, a clinic partnering with a neighborhood hip-hop artist to bring music to the waiting room, an architect approaching workplace design with redoubled attention to what it takes for employees to thrive, a technology developer introducing its virtual reality platform to a trauma-afflicted community. . . .

When scientists and artists recognize one another as equal partners, each with something to share with the other, the multiplier effect advances individual and community health and wellbeing. The guiding principle is simple: science and the arts generate equally valid knowledge and learnings.

It will take a seismic culture change to create new norms. But with the right investments, full respect for the authority and insight embedded in diverse experiences and knowledge backgrounds, and a willingness to have new kinds of bold conversations, systems and structures can be overhauled and art and aesthetic experiences can assume their rightful place in driving health and wellbeing.





A Dynamic but Fragmented Field

A continuum of research—from basic scientific discovery to translational investigation to clinical and community application and evaluation—attests to the ferment of neuroarts activity. Practice activities are seemingly everywhere as well—in clinics and hospitals, community health centers and group care settings, community arts organizations and social service and advocacy agencies, workplaces, and public spaces (NeuroArts Blueprint Initiative 2021b).

In the United States, the National Institutes of Health and the National Endowment for the Arts are dedicating substantial federal resources to the intersection of the arts and health. State- and local-level activities are also emerging, and numerous professional associations and cultural institutions are involved, some exclusively focused on showcasing the links between the arts and health, others touching on neuroarts as part of a broader mandate.

Globally, Australia, Canada, Cuba, Finland, New Zealand, Sweden, and the United Kingdom are among the countries that have moved further, faster, to activate use of the arts and aesthetic experiences to support health and wellbeing. The World Health Organization (WHO) has ramped up its work in the field, establishing an Arts & Health Program in 2019, while the World Bank is supporting policies that draw the line from the arts to health to economic wellbeing (Biondo, Vakis, & Dalton 2020). Further momentum can be seen in training and education, where a growing number of courses, curricula, and degree programs are available.

Moreover, our survey of stakeholders reveals a constituency eager for neuroarts: across gender, age group, race and ethnicity, geography, and professional activity, researchers, arts practitioners, artists, and policymakers say they want to help cultivate the field. They also see the value of integrating neuroarts into numerous fields—among them, childhood development, mental health, education, community health, public health, complementary or integrative medicine, physical health, allied health, and community development (Lake Research Partners 2021).

But significant fragmentation diminishes the potential impact of neuroarts and undermines the capacity to sustain and scale success. There has not

yet been a dedicated effort to define the ecosystem, nurture an interactive network of stakeholders, or foster vigorous institutional commitments. Lacking opportunities to overlap in professional circles, scientists and arts practitioners remain unfamiliar with the idioms, priorities, and norms of one another's fields. Implicit biases have tended to assign greater worth to certain disciplines, experiences, and sources of knowledge over others, and the voices of community advocates and healthcare consumers are too often left out of the conversation altogether. Systemic issues related to power differentials, funding, and status across disciplines and sectors have yet to be fully confronted, which creates a barrier to sharing the stories and data needed to grow the knowledge base.

Cultivating the neuroarts ecosystem requires that we consider the influences of context, culture, and history on worldview; acknowledge and challenge biased assumptions; and craft broad, inclusive strategies.

Consistent terminology is another fundamental barrier. Along with *neuroarts*, many other terms are being used to describe the role of the arts in service to health, including *neuroaesthetics*, *empirical aesthetics*, *art therapy*, and *arts in health*, making it difficult to aggregate research findings. While many small-scale studies and potentially replicable exemplars provide promising insights, they lack broad influence because they are not widely shared. Published research too often remains within the confines of a single discipline, and lack of communication results in duplicative studies, prevents discovery from building on discovery, and limits generalizable conclusions. The absence of common reporting guidelines, an inflexible view of what constitutes rigor, a narrow understanding of the many ways of knowing, and inconsistent methodological approaches are further barriers.

Comparable fragmentation exists in practice, where a patchwork of arts-related activities is siloed by discipline. People working in creative arts therapy, arts in health, behavioral therapy, occupational and physical therapy, architecture, design, and elsewhere have few opportunities for cross-fertilization. These practitioners too often experiment and innovate alone, observing results that go unshared. While some of their work has been formally evaluated, much has not. Without systematic support or interest from the scientific community, their influence rarely matches their dedication, resulting in lost knowledge and fewer opportunities for scaling.

The same pattern impedes development of an infrastructure for neuroarts. The transdisciplinary and extradisciplinary educational and training opportunities that would expose students and early-career professionals to the broader neuroarts landscape, diversify the field, and bridge research to practice remain

sparse. Supportive policies, including systematic public sector commitments and insurance reimbursement incentives, have yet to be put in place. Likewise, the business sector has not paid much attention to the arts as a tool to build a stronger, more innovative workforce.

Lack of robust funding opportunities is a potent barrier in all corners. The very nature of the field means that research activities do not fit readily within the mission of a single government agency, yet interagency cooperation can be difficult to secure. On the practice side, interventions are disproportionately dependent on philanthropic funders, which are typically nimbler than government funders, but also tend to be walled off from one another. And insurance coverage for arts-related health interventions is inconsistent and limited, especially in the United States.

All this fragmentation results in a degree of confusion and uncertainty. Many of the stakeholders simply don't know one another. They exchange ideas erratically and lack collaborative structures that would enable them to communicate, uncover common interests, share learnings and experience, and achieve mutual goals. Across the spectrum of neuroarts, they operate in separate academic, clinical, and community settings; read different journals; attend different conferences; and engage with very different allies.

A cohesive ecosystem is the solution to fragmentation, bringing professionals and knowledge keepers in every corner together so that the transdisciplinary and extradisciplinary fertilization critical to progress can occur at scale.



The Work Ahead

Elevating the transdisciplinary and extradisciplinary research and practice activities that are core components of a neuroarts ecosystem, and especially weaving them together, is a complex task. The strands are many, with much to do.

An equity imperative exists at every level—in opportunities to pursue relevant research and practices, in the value assigned to different art modalities, and in the populations that contribute to the growth of the field and have access to its benefits. This ecosystem must include a full constellation of voices—not only as players *invited* to the table but as part of the community *choosing* the table at which they sit, and then *setting* it. Diversity, equity, and inclusion are not merely catchphrases but rather are central assets that allows neuroarts to thrive.

The launch of a new field provides a rare opportunity to imbue equity in every phase of planning and implementation, ensuring that what is built meets the needs of all people from its inception.

A field as potentially transformative as neuroarts also demands:

- Research to grow the knowledge base, including learnings drawn from narratives and the experiences of those who engage with art.
- Strategies to implement and evaluate arts-based practices, pilot new ones, and scale those with proven benefits to individual and community health and wellbeing.
- Measures to attract and incentivize a diverse and inclusive cadre of professionals, including educational on-ramps, mentoring, resources for early-career investigators, promotional pathways, and appropriate compensation.
- Policy commitments aimed at elevating sustainable public sector and private sector investments and support.
- Adequate funding to advance knowledge and pay for arts-related services.
- Bold, effective leadership, from the community to academia to governance at every level; among scientists, practitioners, activists, patient advocates, and a host of other stakeholders; and within and across research and arts practice settings.
- Persuasive framing, messaging, and communications strategies that highlight the field's uniqueness, tailored to the many individuals and groups that have a stake in neuroarts.



The vision of a widely recognized and broadly influential neuroarts field will take many years to fully realize. As knowledge builds, we will learn more about what works, in which settings, at what dose, and for whom. Based on iterative agreements of what success looks like and how it can be achieved, measurable short-term wins and long-term milestones will support systematic, goal-oriented implementation. To build confidence and momentum, we also need to share more stories—the robust, revelatory narratives that capture the cultural frames and humanity of the people and communities who have long drawn on arts and aesthetic experiences as sources of strength, indeed as a form of medicine.

The *NeuroArts Blueprint* offers an actionable strategy for moving systematically along many parallel tracks to accomplish all of this. Five core principles, five core findings, and five core recommendations provide the framework for this vision.

Five Core Principles

Experiencing art is fundamental to being human, a common thread across cultures, racial and ethnic backgrounds, age groups, income levels, and skill sets. The arts offer a shared language, a means of elevating diverse voices, and a catalyst for action.

The arts, as expressed through many modalities, have demonstrable, evidence-based impacts on physiological and psychological health and wellbeing.

Science and technology make possible the ability to understand and measure the biological effects of the arts and aesthetic experiences on individuals and populations.

Neuroarts provides the connective tissue to bring together science, the arts, and technology as equal partners to advance health and wellbeing.

The benefits of the neuroarts field must be readily, consistently, and equitably accessible to all populations across the lifespan and in every community around the world.



Five Core Findings

The arts and aesthetic experiences impact human biology and behavior in ways that differ markedly from any other health intervention. Scientific studies demonstrate that many art modalities act on complex biological systems and mechanisms to generate physiological and psychological effects. As research applies increasingly sophisticated technological tools to learn more, practitioners are already using dynamic and targeted arts interventions to advance health and wellbeing.

Preliminary evidence suggests that the neuroarts field provides economic and social benefits. Metrics to determine the sum of the benefits, rather than just the contributions of individual components, can help capture the field's added value across sectors. Empirical research can document the potential for arts practices to reduce healthcare costs (by reducing demand for more costly clinical interventions), promote economic development, strengthen the social fabric, and advance wellbeing. The lived experiences of arts practitioners and the communities they serve are also crucial sources of rigorous evidence.

Neuroarts-related activities are everywhere, but they lack a cohesive structure. Although diverse stakeholders within and beyond traditional disciplines and sectors are vigorously engaged with various facets of neuroarts, no well-delineated ecosystem brings them together to coalesce the field. Neuroarts needs a broadly inclusive platform through which robust scientific evidence can emerge from silos, standards of practice can evolve and scale, and knowledge of many types can disperse in multidirectional fashion, allowing transdisciplinary and extradisciplinary collaborations to become the norm. Neuroarts also requires dedicated funding streams, supportive public sector and private sector policies, and targeted framing, messaging, and communications strategies.

Now is the moment to cultivate the neuroarts field. Scientists, practitioners, artists, knowledge keepers outside traditional disciplines, and institutions of all stripes are open to new paradigms and enthusiastic about the possibility of driving neuroarts forward. An inclusive set of stakeholders stands ready to accelerate transdisciplinary and extradisciplinary research, showcase practice exemplars, share knowledge and resources, and reach into new communities to strengthen the ecosystem. Public-private partnerships are already being developed, and there is broad interest from arts-related and cultural organizations, whether they have a health-related mission or not; from scientific associations, whether they have previously engaged with the arts or not; and from a diverse group of issue- or disease-focused advocacy organizations.

Leadership and community-based engagement are essential for neuroarts to progress. The complexity of the health challenges facing society can only be tackled by making space for all points of view. Top-down and bottom-up strategies are both needed to develop neuroarts leaders, champions, and advocates as effective communicators positioned to expand the constituencies committed to the field. At local, regional, national, and global levels, visionary leaders with far-reaching personal and professional networks can play central roles. We also need to nurture leadership capacity among early-career researchers and arts practitioners who see value in embracing the inherently complex nature of transdisciplinary and extradisciplinary work. Within public agencies, private organizations, and academic settings, leadership is key in gaining institutional commitments at the highest levels and engaging diverse stakeholders. Equally important are community leaders and others with grassroots connections and lived experience who have earned the trust of local constituencies.

Five Core Recommendations

Building on the principles and findings, the *NeuroArts Blueprint* offers the following core recommendations, each with action steps, to guide the process of developing a transdisciplinary and extradisciplinary ecosystem in which stakeholders align around common goals at the intersection of science, arts, technology, and health:

Strengthen the research foundation of neuroarts.

Honor and support the many arts practices that promote health and wellbeing.

Expand and enrich educational and career pathways.

Advocate for sustainable funding and promote effective policy.

Build capacity, leadership, and communications strategies.

Stewardship of the Implementation Process

This *Blueprint* does not pair each recommendation and action step with a responsible party, recognizing that many combinations of stakeholders and partners will engage as the neuroarts ecosystem evolves. Sometimes, they will work within their own fields, often they will interact across disciplines and sectors, and always they will pursue a collective vision, building on the many forward-thinking efforts already underway.

Academic and other institutions can create their own centers to further neuroarts while a central resource hub should serve as a global clearinghouse as disparate efforts move forward. As it provides momentum for an iterative process, the hub will connect the various institutional efforts, offer a global home for a vast arts and health research platform, foster a network of community-building connections, centralize convenings and resource development, promote scaling, and catalyze further action.

Three early implementation steps, overseen through this resource hub, offer stakeholders the framework in which to collaborate, drive toward common goals, and advance the core recommendations of this strategic plan over the next five years:

- Establish a cross-cutting Global NeuroArts Advisory Council to serve as a springboard for boundary-crossing conversations that develop consensus on next implementation steps, identify priorities, foster community, track progress, and support the evolution of the field.
- Develop asset maps to identify stakeholders and sectors that are integral to the neuroarts ecosystem, defining both the reach of the field and the boundaries around it.
- Broaden the knowledge base and implementation capacity with a commissioned series of white papers.

RECOMMENDATION

Strengthen the research foundation of neuroarts.

A synthesis of existing findings is the launching point for determining what we know, identifying gaps, and building on the evidence to learn more. Beyond the imperative of collecting, integrating, and sharing existing work, a rigorous quantitative and qualitative agenda will allow new scientific questions to be identified in the realms of basic, translational, clinical, and community-based study research. Defining the core elements of arts-based interventions and developing consistent study design and evaluation protocols will enable comparisons and allow each set of findings to inform others. This approach requires a consensus among stakeholders on terminology, reporting requirements, high-quality methodology, outcome measures, and platforms on which to exchange knowledge and scale success.

Importantly, the neuroarts community will need to stretch its thinking about what constitutes rigor, respecting the many ways of knowing that can help determine what works. While no simple formula exists for evaluating interventions that take aim at social determinants of health or perceptions of wellbeing, a number of validated tools merit closer looks.

Action Steps

- Establish and promote an interactive arts and health research platform for neuroarts, modeled on the vast PubMed search engine. A comprehensive, artificial intelligence (AI)-driven centralized repository and data management portal will enable intuitive searches and inquiries across a curated and dynamic landscape.
- Conduct comprehensive, in-depth systematic reviews and analyses of peer-reviewed research and published grey literature.
- Develop a prioritized basic, translational, clinical, and community-based research agenda designed to produce comparable findings that meet agreed-upon standards of rigor.
- Develop or expand translational models that bridge research and practice and offer implementation and scaling insights.
- Conduct a feasibility study for a model Neuroarts Mechanism Map that depicts the brain circuitry and neurotransmitter systems engaged through the arts and aesthetic experiences.

RECOMMENDATION

Honor and support the many arts practices that promote health and wellbeing.

To contribute their full potential to the growth of neuroarts, arts practitioners should be recognized and empowered as equal partners with scientists. They need opportunities to explore the biological underpinnings of their work, contribute to the growing body of evidence for the field, and share practices.

As well, the practitioner voice needs to be heard in conversations and convenings that explore taxonomy, articulate priorities for developing and testing interventions, consider the degree to which diverse arts practices can meet on common ground, and identify tools and techniques to adapt and scale effective interventions. When practitioners are embraced as codesigners of strategies, standards, and structures to advance the field, they gain the authority and visibility to inspire interest in their work and to pursue positive outcomes.

Broad-based input at all levels helps to elevate practices that resonate with diverse populations. Ensuring that their content is developed and implemented to meet the needs and goals identified by the individuals and communities they purport to serve requires intentionality, a commitment to inclusiveness, deep listening, and flexibility.

Action Steps

- Promote narrative changes that elevate the importance of arts practices as tools for health and wellbeing.
- Develop uniform strategies for collecting and analyzing outcome measures that guide practices aligned with neuroarts.
- Evaluate technologies that can be used to amplify and disseminate effective interventions.
- Identify and collaborate with institutional partners that can integrate arts practices into their health-related activities.
- Scale evidence-based practice.

RECOMMENDATION

Expand and enrich educational and career pathways.

Well-defined educational and training pathways, course and curriculum development, and strategies for career advancement encourage entry into the neuroarts field and help retain those already working there. The establishment of a new field provides a rare opportunity to prioritize equity throughout the educational pipeline, with particular attention to racial and gender equity.

To build capacity and expand scholarship and its translation, neuroarts education in some form should begin in early childhood, continue through secondary school, and offer well-defined on-ramps with undergraduate coursework and graduate-level degree programs. Although no single curriculum can ever serve an entire field, a package of synergistic courses and case studies can provide a shared grounding to link disciplines. The ultimate goal is to allow individuals to enter the field of neuroarts from almost anywhere.

In addition to traditional academic routes, new models that embrace multimodal delivery should be considered, including online courses and workshops, grand rounds, internships, and mentoring. Opportunities for collaborations and rewards, including scholarships and prizes targeted specifically at new and early-career investigators, can also widen interest. Deliberate educational boundary busting is called for to encourage cross-cutting collaborations within and across the various scientific and practice disciplines that intersect with neuroarts.

Action Steps

- Expand the content and availability of academic training at all educational levels, including opportunities to explore the biological influences of the arts.
- Build capacity and incentives that draw students into the neuroarts field and encourage early-career professionals to pursue relevant research or practice.
- Recognize and reward excellence, including through scholarships, awards, and grant funding.
- Expand community-based training to promote neuroarts in nontraditional settings.

RECOMMENDATION

Advocate for sustainable funding and promote effective policy.

As the neuroarts ecosystem evolves, dedicated and consistent funding and sound and innovative policies are essential to grow a broad-based transdisciplinary and extradisciplinary field. While individual champions will likely jumpstart engagement, it will ultimately take institutional commitments from a network of diverse public sector and private sector partners for neuroarts to flourish.

In the public sector, establishing positive economic and social impact is likely to have particularly strong appeal, whether by documenting systemwide cost savings or measurable effects on individual and community health and wellbeing. Globally, more information is needed about how nations are assigning public dollars, or blending public and private resources, to advance neuroarts. Evidence that engaging in arts activities can reduce demand for more costly healthcare could encourage insurers to provide coverage for arts-related interventions while other incentives can be identified to attract philanthropies and employers. Social impact investing, crowdsourcing, and other entrepreneurial opportunities are also potential entry points.

Action Steps

- Establish a funding source for pilot studies of arts-related health interventions with scaling potential to gather the empirical evidence that researchers need to compete for larger, multisite investigations.
- Build the economic case that investing in evidence-based arts practices can lower the downstream costs of health challenges.
- Develop an agile, multistep fundraising strategy for the field, beginning with assembling a comprehensive database of potential thought partners and funders.
- Deepen knowledge of global funding and policy frameworks.
- Identify and pursue strategic public sector and private sector policies that take neuroarts beyond the purview of individual champions and solidify its infrastructure.

RECOMMENDATION

Build capacity, leadership, and communications strategies.

The neuroarts ecosystem requires a solid infrastructure that allows stakeholders to convene, connect, and partner. Stewardship is essential to the *Blueprint's* proposed implementation activities. The infrastructure includes a clearinghouse for information, aggregated data, research findings, case studies, and other resources; it also requires a center of gravity that draws together advocates, influencers, and champions; elevates voices that often go unheard; and fosters experimentation and innovation.

This developing field will need many kinds of leaders—early-career investigators and practitioners who think fluently across disciplines, dynamic institutions prepared to take center stage as momentum builds, and champions at every level and of every age. Comprehensive framing, messaging, and communications strategies using clear and accessible language are key. Rigorous data need to be presented, as do compelling stories that capture the vibrancy of neuroarts globally and the power of carefully implemented and evaluated interventions to achieve sought-after outcomes. More high-profile messengers, influencers, and local advocates can be recruited to spread the word and increase the field's reach.

Action Steps

- Build out the resource hub, established as an early implementation step, as an agent of convergence—the gravitational force that brings together the growing number of activities in the field of neuroarts and builds momentum for more.
- Encourage the establishment of institutional centers to foster rigorous research and training; facilitate knowledge sharing with practitioners, community and patient advocates, and other stakeholders; feed findings and experiences into the resource hub; and contribute to the growth of the field.
- Establish and deepen alliances with public and private organizations around the globe.
- Design strategies to build individual, community, and institutional leaders who can promote the field within their own science, arts, technology, health, and community networks.
- Conduct social science research to inform the ways in which neuroarts is framed and messaged and tell stories about promising practices and engaged communities.
- Develop and implement a comprehensive global communications plan.



Call to Action

The *NeuroArts Blueprint* offers a roadmap to the future, recognizing that implementing the Recommendations and Action Steps outlined here requires a multiyear initiative. As we move to coalesce neuroarts, it is again crucial to acknowledge the deep bench of stakeholders whose energy, creativity, and leadership have made it possible to cultivate the ecosystem.

More champions are crucial, helping to foster the momentum that allows partnerships to sprout, ideas to crystallize, and structures to be built—and to ensure that equity is front and center of decision-making from the outset. To become sustainable, these initial efforts must eventually generate incentives that are sufficiently aligned to foster institutional commitments—among scientific and arts bodies; in academic, workplace, healthcare, and community settings; from governments; and across global organizations.

The field will also need stewardship. In an identifiable home, resources can be aggregated and action catalyzed; basic, translational, clinical, and community-based research can work hand in hand with practitioners to grow and apply knowledge; and all stakeholders can have a voice in shaping future directions.

Together, scientists, arts practitioners, artists, educators, employers, funders, policymakers, healthcare advocates and consumers, and community leaders and activists can pursue a collective vision, grow knowledge and translate it into use, innovate and scale effective pilot programs, and dedicate the resources that allow all of that to endure. By recognizing themselves as part of an interdependent ecosystem—core members of a community dedicated to advancing neuroarts—every stakeholder can help position the field as a high priority. A shared identity and an effective framing, messaging, and communications strategy are central at every step.

Bringing the neuroarts field to full flower opens up extraordinary possibilities at an unprecedented time in history. “How do we take advantage of this moment of confluence to actually have it be a moment of transformation?” asked Maria Rosario Jackson, PhD, Institute professor at the Herberger Institute for Design and the Arts and Watts College of Public Service and Community Solutions, Arizona State University (Jackson 2020). With its strategy for establishing a well-defined, evidence-based, and inclusive neuroarts ecosystem, the *NeuroArts Blueprint* is intended to help answer this critical question.

An extraordinary opportunity is at hand—by fully integrating the arts into health-building activities that are accessible to all, we can foster individual health and wellbeing, strengthen our communities, and fulfill a human birthright.

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Pg. 1: *Carousel* (detail). Various MRIs of the artist’s brain. Digital collage. Artwork by Elizabeth Jameson. Used with permission of Elizabeth Jameson.

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Pg. 17–18: Photo by Edward Marritz, May 2018. Used with permission of Mark Morris Dance Group/Dance for PD.

Pg. 29: *Mind on Fire III*. Saggital view of the artist’s brain. Drypoint etching on paper. Artwork by Elizabeth Jameson. Used with permission of Elizabeth Jameson.

NeuroArts Blueprint

Advancing the Science of
Arts, Health, and Wellbeing



Overview

The ability to experience the arts and aesthetic experiences is among the defining characteristics of being human. We take in the world through our senses; smell, sound, taste, touch, and vision are powerful pathways into the brain. Through electrical and biochemical processes, these stimuli provoke a complex cascade of reactions that affect multiple biological systems and alter our brains and bodies. In short, we are wired for art. Beyond this physiological response, the arts and the culture they create are the language of humanity, helping to make meaning out of the world around us—an imperative for health and wellbeing.

How can we channel those simple and profound facts into evidence-based practices? That is the foundational challenge of *neuroarts*—defined here as the transdisciplinary and extradisciplinary study 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 wellbeing. A transdisciplinary approach brings different disciplines together, but in this report we go further, also advocating for an extradisciplinary commitment that includes knowledge keepers outside traditional disciplines, including the local people who understand the assets and challenges of their own communities.

Traditional hierarchies have too often downplayed the knowledge birthed from lived experience. Agents of change dwell in academic centers and policymaking circles but they are also found in the communities where neuroarts is used in service of greater health.

The word *neuroarts* has its origins in the field of *neuroaesthetics*, which specifically explores the underlying brain mechanisms that are engaged in arts and aesthetic experiences. Neuroarts incorporates a broader set of physiological systems and combines them with the knowledge and resources to deploy in service to human needs.

The *NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing* is a partnership between the [Johns Hopkins International Arts + Mind Lab: The Center for Applied Neuroaesthetics](#) (IAM Lab) and the Aspen Institute's [Health, Medicine & Society Program \(HMS\)](#). With its advocacy of deep

Defining the terms

Neuroarts is defined in this *Blueprint* as the transdisciplinary and extradisciplinary study 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 wellbeing. As used here, **aesthetic experiences** are the feelings, emotions, and perceptions that derive from any of the art modalities.

The **neuroarts ecosystem** (also referred to as the **neuroarts field**) provides the robust framework in which stakeholders across sectors and disciplines can direct their collective power to improve the health and wellbeing of individuals and communities. The goal of this *Blueprint* is to elevate that common cause.

A caution: Neuroarts has not been uniformly adopted as a term across research and practice activities and is not widely known by the public; we make no claims regarding its long-term utility.

systemic changes, this groundbreaking global initiative aims to shake up the status quo and set forth an actionable roadmap to strengthen, formalize, and propel an emerging field. By connecting stakeholders across a vast and disparate landscape of experiences and knowledge, we can create a cohesive ecosystem—one that recognizes the power of the work already underway, the imperative of a level playing field, and the transformative opportunities that build on common goals.

The NeuroArts Blueprint initiative conceives of neuroarts as an ever-evolving ecosystem with many interdependent strands that are strongest when they are woven into an inclusive community.

This report, the result of two years of in-depth study and consultation, advances bold strategies and recommendations to build the research, practice, and stakeholder interest that can drive the culture shift necessary to elevate neuroarts. We have both short-term objectives and a long-term

vision of success. Over the next five years, we expect to stitch together the core components of the ecosystem, coalescing a field that engages a well-defined set of stakeholders to pursue a common mission and shared goals. In the years that follow, that ecosystem should mature, becoming a well-recognized and sustainable field that aligns structural incentives and drives culture change.

The *NeuroArts Blueprint* lays out five core principles, findings, and recommendations, which are summarized briefly in this section and detailed later in this report.

Five Core Principles

Experiencing art is fundamental to being human, a common thread across cultures, racial and ethnic backgrounds, age groups, income levels, and skill sets.

The arts, as expressed through many modalities, have demonstrable, evidence-based impacts on physiological and psychological health and wellbeing.

Science and technology make possible the ability to understand and measure the biological effects of the arts and aesthetic experiences on individuals and populations.

Neuroarts provides the connective tissue to bring together science, the arts, and technology as equal partners to advance health and wellbeing.

The benefits of the neuroarts field must be readily, consistently, and equitably accessible to all populations across the lifespan and in every community around the world.

To inform our work, we assembled a diverse 25-member Advisory Council (see membership list at the end of the Executive Summary); conducted in-depth literature reviews and analyses ([NeuroArts Today: State of an Emerging Field](#)); held eight stakeholder convenings to explore communications, policy, practice,

research, and technology, including two with a global focus; commissioned an economic analysis (see [Spotlight: Analyzing the Economic Value of Neuroarts](#)) and a 300-person survey of neuroarts stakeholders (see [Spotlight: Surveying the Stakeholders](#)); published a World Bank report that linked art to economic development ([Human Capital and the Arts at the World Bank Group](#)); and exchanged ideas with hundreds of other experts and stakeholders. See the [Appendix](#) for *NeuroArts Today*, the full economic analysis and survey reports, and the World Bank report (NeuroArts Blueprint Initiative 2021a).

The bottom line is clear: We should move the development of a neuroarts ecosystem forward at full throttle. Yes, we need to learn more, and dedicated resources are essential. Certainly, authentic leaders with genuine respect for intersectionality, in all of its complexity, must gain more authority. But there is already a great deal of knowledge and capacity to be deployed, acting with intentionality, commitment, and precision.

Five Core Findings

The arts and aesthetic experiences impact human biology and behavior in ways that differ markedly from any other health intervention.

Preliminary evidence suggests that the neuroarts field provides economic and social benefits.

Neuroarts-related activities are everywhere, but they lack a cohesive structure.

Now is the moment to cultivate the neuroarts field.

Leadership and community-based engagement are essential for neuroarts to progress.

“Together, we are growing a scientific field that allows us to unleash the power of the arts to restore health, help prevent disease, and facilitate human flourishing. Our vision is as sweeping as it is bold—to be our greatest selves.”

Anna Deavere Smith, actress, playwright, author, professor; cochair, NeuroArts Blueprint Advisory Council

Our professional survey reveals a constituency eager to be part of the neuroarts ecosystem. Across gender, age, race, geography, and professional activity, researchers, arts practitioners, artists, funders, and policymakers say they want to help cultivate neuroarts. They see its value along many different avenues, including childhood development, mental health, education, community health, public health, complementary or integrative medicine, physical health, allied health, and community development (Lake Research Partners 2021).

The context in which the *NeuroArts Blueprint* was developed changed considerably as this project unfolded. The COVID-19 pandemic, the Black Lives Matter movement, and the terrible toll of “diseases of despair”—notably substance use and suicide—have highlighted profound health inequities in the United States and around the world. That has made our commitment to equity—the intention to ensure that the tools and power of the arts are readily, consistently, and equitably accessible to all populations and in every community across cultures, racial and ethnic background, socioeconomic status, skill set, and more—timelier than ever.

In 2020, the pandemic sparked an outpouring of creativity in response to the social isolation and mental health challenges it imposed. People under stress or experiencing trauma might not have fully understood the biological basis of their thirst for online music, theatre, visual arts, or dance. They might not have been thinking about their glucose or cytokine levels when they spent time in an inviting public park or plaza. But in the dark era of the coronavirus, they felt the physiological and psychological power underlying such activities.

The clarity with which structural inequities and racial injustice emerged that same year added urgency to a conversation that was already underway, elevating the

What are health and wellbeing?

While *health* and *wellbeing* can be defined in many ways, the 1948 preamble to the World Health Organization’s constitution offers a good fit for purposes of this *Blueprint*: WHO defines *health* as “a state of complete physical, mental, and social wellbeing, not merely the absence of illness or infirmity” (World Health Organization 2006).

The Robert Wood Johnson Foundation, the largest healthcare philanthropy in the United States, provides useful context as well, describing *wellbeing* as “people’s physical, mental, and social health, and the opportunities they have to create meaningful futures. . . . It is tightly linked with the wellbeing of our communities, our environment and our planet” (Robert Wood Johnson Foundation n.d.).

voices of people who have the intelligence of lived experiences and are challenging hierarchies of status and power. We hope that will speed the momentum for neuroarts, which can be viewed as a component of complementary and integrative medicine—described as the “diverse medical and healthcare systems, practices, and products that are not generally considered part of conventional medicine” (Tabish 2008).

As the neuroarts research base expands, the use of arts practices across modalities in service to health and wellbeing is becoming a global phenomenon in clinical and community-based settings. The increasing availability of innovative technology—itsself a therapeutic form of art—is also a catalyst for deepening the connection between science and the arts. Trends in the United States reflect a growing interest in these areas, and other countries, including Australia, Canada, Cuba, Finland, New Zealand, Sweden, and the United Kingdom, have moved further and faster to activate the use of the arts and aesthetic experiences to support health.

At the crossroads of science, the arts, technology, and health, neuroarts is an evolving field of study that explores the impact of a range of art modalities and aesthetic experiences on the human brain, body, and behavior. As robust, empirical evidence and innovative practice join forces, they contribute to an ecosystem that will ease some of the most intractable health problems the planet faces and lay the foundation for wellness.

Much more needs to be done to formalize and coalesce the field. This *Blueprint* provides both impetus and guidance with five core recommendations and associated action steps.

Those who contributed their ideas and insights—diverse as they are in background, training, and beliefs—share the evidence-based conviction that, with appropriate support, direction, and commitment, the arts and aesthetic experiences can achieve their vast potential to advance health and wellbeing.

Five Core Recommendations

Strengthen the research foundation of neuroarts.

Honor and support the many arts practices that promote health and wellbeing.

Expand and enrich educational and career pathways.

Advocate for sustainable funding and promote effective policy.

Build capacity, leadership, and communications strategies.



Surveying the Stakeholders

To learn how stakeholders view the emerging field of neuroarts, the NeuroArts Blueprint initiative commissioned Lake Research Partners to conduct a global survey, published as [Findings from an Online Survey of Stakeholders](#). More than 300 researchers, healthcare practitioners, artists and cultural influencers, health policy experts, and voices from philanthropy, technology, and business—all of them representing diverse gender, racial, and age groups—offered their insights (Lake Research Partners 2021).

Key survey findings show that respondents view neuroarts as a field rich with opportunities to transform health, that they recognize the power of collaboration, and that they acknowledge the barriers standing in the way of realizing the field's full potential.

Among the key findings:

- **Art matters to health.** The survey found that the core principles articulated in this *Blueprint* resonate with the overwhelming majority of respondents. Virtually everyone agrees that experiencing art is fundamental to being human (97%), that neuroarts advances health and wellbeing (94%), and that science provides evidence that art changes the brain and body (91%). Specifically, they saw “a lot of value” in integrating neuroarts into the fields of childhood development (86%), mental health (86%), and education (81%).
- **Knowledge about the neuroarts field is limited.** Most respondents see themselves as part of the neuroarts community, yet only 30 percent say they know quite a bit or a great deal about the field. The need to grow knowledge is evident in a shift in how a survey question was answered over time—initially, 60 percent of respondents said they were part of the community but by the end of the survey, after reading and learning more about neuroarts, that figure had grown to 80 percent. Neuroarts, observed one respondent, “is emerging and not many people know of it. It has a PR problem, essentially.”
- **Stakeholders want to connect with the field.** Regardless of their current connections to neuroarts, almost all of the respondents agree that the opportunity to bring art into discussions about health and wellbeing has not been fully realized (97%). And they want to change that—a solid majority

has some degree of interest in engaging in and helping to cultivate the field (82%). Notably, a younger population is most interested—77 percent of those under 50 said they were “extremely” or “very likely” to engage. Strategies to move forward, according to respondents, include “establishing a baseline of understanding and a clear scope of desired outcome, where everyone’s roles are clearly defined,” “establishing a set of practices for conducting research in a new interdisciplinary field,” and overcoming language barriers.

- **Collaboration across disciplines is the way forward.** Almost everyone recognizes the benefits of collaboration to bring together practitioners in the arts and health fields, academics, and researchers around a common goal (97%) and to create a community of colleagues and peers who offer one another diverse skills and expertise to call on (97%). One respondent described the consequences of the existing fragmentation: “If you don’t know who is doing what at what level, there is no chance of meaningful collaboration.”

Survey respondents also indicated that collaboration would increase the resources available to artists and practitioners to promote health and wellbeing, ensure the availability of sustained grant funding, break down structural barriers so that science and the arts can team up, and solidify evidence so that arts-related interventions and practices become commonplace in healthcare (from 93% to 97% of respondents indicate each of these is beneficial). “We tend to work in silos,” observed one. “We need to integrate and support evidence-based approaches across multiple disciplines and the corporate culture.”

- **Funding is the top barrier to collaboration.** Ninety-one percent of stakeholders say funding resources are an overall challenge to collaboration, and 83% say funding is critical to cultivate the field. Developing a clearinghouse of grant and other funding opportunities is the top priority for 65% of respondents, a figure that rises to 76% among people of color. Asserted one respondent, “The lack of funding is the greatest challenge because without it we cannot get the evidence we need to refine or validate interventions.” Beyond funding, other top challenges to collaboration include organizational capacity and the ability to scale programs, time commitment, and priorities.

Summarizing the state of play, one respondent called neuroarts “part of the future of arts and culture and healthcare—the next enlightenment, so to speak. They both need each other, and the scientific research is paving the way for this opportunity to be created.”



A Powerful Scientific Foundation

Artists have always understood the power of the arts to heal and to help humans thrive. In many ways, science is now catching up, while adding new layers of knowledge, understanding, and application.

Dramatic scientific and technological breakthroughs in recent years have made it possible to study many of the physiological and psychological processes triggered by the arts and aesthetic experiences. Noninvasive ways to see inside the body—including cutting-edge imaging systems, wearable biomarker sensors, and other advanced tools—provide the means to trace and measure our sensory and motor responses, opening up remarkable knowledge-gathering pathways.

New data allow us to characterize the complex biological relationships at work, spawning still more innovation. As evidence accumulates, our capacity to translate what has been learned and apply it to clinical and community practice continues to grow. At the same time, ever-greater computational power allows for tailored interventions based on individual biology, analyses of large datasets, evaluative research to assess their impact, and broad dissemination of effective approaches.

A groundswell of interest in the brain has helped to drive this science forward. The designation of the 1990s as the Decade of the Brain is credited with attracting vast numbers of neuroscientists, molecular biologists, and computer scientists, as well as others outside traditional disciplinary boundaries (Jones & Mendell 1999). In FY2014, the US government launched the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative, an audacious undertaking designed to unlock the mysteries buried within the 100 billion neurons and 100 trillion connections of a single human brain. The National Institutes of Health (NIH) calls the BRAIN Initiative “the most groundbreaking approach ever contemplated to understanding how the brain works and how disease occurs” (National Institutes of Health n.d.a). By late 2020, the NIH had made more than 900 awards, totaling \$1.8 billion, to advance the initiative’s goals (National Institutes of Health 2020). China (Cyranoski 2018) and the European Union (Human Brain Project n.d.) have also launched ambitious efforts to advance brain science.

Their cumulative findings help to explain how the multilayered brain changes nanosecond by nanosecond in response to stimuli and how this neuroplasticity influences the way in which we process the arts and aesthetic experiences. The field of neuroaesthetics, where brain science and the arts intersect, has been immensely important in advancing this knowledge. Researchers have begun to identify the cognitive and neural systems that are engaged, including the higher-order emotional, reward, and motor pathways. The intricate and interactive responses of the visual, auditory, somatosensory, vestibular, and olfactory neural networks to human-generated or environmental stimuli remain the source of tremendous scientific curiosity (Coburn, Vartanian, & Chatterjee 2017).

The complex network of interconnected biological systems impacted by the arts and aesthetic experiences goes beyond the brain to encompass endocrine, immune, circulatory, and respiratory functions as well. We see, for example, that music played at a certain frequency decreases levels of cortisol, a hormonal marker of stress, while increasing oxytocin, a hormone sometimes used therapeutically to treat depression and anxiety (Akimoto, Hu, Yamaguchi, & Kabayashi 2018). Other studies have shown that live music can shorten stays in neonatal intensive care (All-Party Parliamentary Group on Arts, Health and Wellbeing 2017); that writing about emotional topics (Petrie, Fontanilla, Thomas, Booth, & Pennebaker 2004) and spending time in nature (Kuo 2015) can influence markers of immune function; that Zumba dance classes can reduce blood pressure and triglyceride levels (Araneta & Tanori 2015); and that community design, including walkability, can enhance glucose control (Mena, Sepulveda, Ormazábal Rojas, Fuentes, & Palomo 2017). In still another example, “recharge rooms”—sites within a hospital that provide an immersive sensory experience of nature—measurably reduced the physiological, hormonal, and behavioral consequences of stress experienced by frontline healthcare workers during the COVID-19 pandemic (Mount Sinai Abilities Research Center n.d.).

The capacity to measure, monitor, and analyze the arts and aesthetic experiences continues to grow as tools evolve, with functional magnetic resonance imaging (fMRI), positron emission tomography (PET) scans, magnetoencephalography (MEG) scans, high-density electroencephalography (EEG), and mobile brain/body imaging (MoBI) expanding the reach of scientific investigation. Measures of variable heart rate, respiration, eye tracking, and other increasingly sophisticated biomarkers, as well as nanotechnology, are also coming into wider use.

The continuum of research activities that reveals the tight links between health and the arts begins with basic scientific discoveries and drives toward the translational and clinical findings that have relevance at the individual and community levels. For example, building on what has been learned about the

neurobiological mechanisms engaged through sound and music, investigators and arts practitioners can collaborate to design a trial that assesses blood pressure and heart rate as someone listens to a song. Those findings could then inform recommendations for clinical cardiac care and community design.

Impact Thinking, developed by the IAM Lab, approaches this evolution with a nine-step consensus framework for documenting, disseminating, and scaling evidence-based arts and mind approaches to health and wellbeing (Arts + Mind Lab, Johns Hopkins University n.d.). At the population level, another important analytical tool has emerged from University College London and is now being used at the EpiArts Lab, a National Endowment for the Arts (NEA) research lab at the University of Florida. By applying the techniques of epidemiology to findings focused primarily on individual health outcomes, the EpiArts Lab probes a broad question: does arts engagement have long-term benefits for health in the United States (University of Florida Center for Arts in Medicine 2021c)?

Among many examples of the knowledge emerging as scientists explore neuroarts:

- The biological influence of music—with its power to enhance wellbeing, modulate the cardiovascular system, boost the immune system, and more—is particularly well documented (Global Council on Brain Health 2020). A randomized controlled trial reported in *Gerontologist* used neuropsychological assessments to establish that singing and listening to music both improve mood and memory among patients with early-stage dementia (Särkämö, Tervaniemi, Laitinen, Numminen, et al. 2014).

Another study, published in the *Journal of Nursing Scholarship*, found that listening to certain types of music improves performance on measures of heart rate among military personnel experiencing postdeployment stress (Gantt, Dadds, Burns, Glaser, & Moore 2017). There is also research on the effects of sound; one small observational study demonstrated that meditating as Tibetan singing bowls were being struck reduced tension, anxiety, anger, fatigue, and depression (Goldsby, Goldsby, McWalters, & Mills 2016).

- A growing body of research suggests that engaging in art influences a child’s brain development, language skills, emotional regulation, capacity for self-expression, and ability to pay attention and learn, all assets that are associated with health and wellbeing over a lifetime. Based on 21 research case studies across cultures, one scholarly paper argues that participating in the arts advances cognitive and social development in children. For example, in transforming a linguistic concept into a visual representation, children

“must learn how to focus their attention, reflect upon their work and its interpretation, express their personal identity, and persist in creation despite setbacks or frustration” (Goldstein, Lerner, & Winner 2017).

Also of interest is the ongoing Adolescent Brain Cognitive Development (ABCD) Study. The largest long-term study of brain development and child health in the United States, ABCD includes the use of aptitude tests and brain scans to learn more about how music affects young participants (Adolescent Brain Cognitive Development 2020).

- A study in *Neuroscience and Biobehavioral Reviews* found that dance can increase the volume of the hippocampus, a brain structure that plays a role in forming new memories (Teixeira-Machado, Arida, & de Jesus Mari 2019), while an *International Psychogeriatrics* article points to dance as a tool to enhance speech-related cognition (Mabire, Aquino, & Charras 2019).
- Research into trauma has identified discrete physiological responses to the arts. One review highlighted the value of various forms of creative art therapy to “allow for access to nonverbal memories in a novel, nonthreatening way.” The paper cited a series of studies that used electroencephalographic tests and functional near-infrared spectroscopy to document specific changes in the brain after making art, including patterns of more powerful cortical activation (Jones, Drass, & Kaimal 2019).
- An explosion of research is occurring in neuroarchitecture, described as a discipline that “transmits knowledge and technologies from the field of neuroscience into the professions of spatial design to inform design solutions that promote wellbeing in public spaces” (Amsterdam University of Applied Sciences 2021). Scholarship here, according to the Academy of Neuroscience for Architecture, is producing answers to “age-old questions about why certain architectural forms more successfully facilitate social interaction, delight, physiological and mental health, as well as cognitive efficiency and work performance” (Academy of Neuroscience for Architecture 2021a).

Despite significant gaps in our mechanistic understanding, these examples hint at a considerable body of accumulating research. When synthesizing the global academic literature on arts and health that had been published in English and Russian, the World Health Organization (WHO) drew on more than 900 publications, covering more than 3,000 studies contained in 200-plus reviews, systematic reviews, meta-analyses, and meta-syntheses, as well as an additional 700 individual studies (World Health Organization 2019). Another deep dive into the literature, undertaken on behalf of the NeuroArts Blueprint initiative

“Although we are only starting to understand how architectural and urban environments can act therapeutically on human minds and bodies, designers have been intuitively exploring these capacities for their restorative effects, in particular for the purposes of managing stress and stress-related diseases.”

Pinter-Wollman, Jelić, & Wells (2018)

and involving a search of the US government database Federal RePORTER for the term “arts and health” from 2000 to 2019, returned almost 12,000 records of federally funded projects, with universities, research institutes, and hospitals receiving more than \$6.1 billion to guide this work. (Those do not include research projects supported by the NEA.)

While all art modalities are the subject of health outcomes research, studies of music and sound outpace those of other forms of creative expression. This is also the area in which the National Institutes of Health is most invested. In particular, we know most about the association between music and memory (NeuroArts Blueprint Initiative 2021b).

One pioneering research venue is the NIH Sound Health Initiative, which so far has invested \$20 million to explore music’s capacity to harness the intricate circuitry of the brain (see [Spotlight: Sound Health and the Sound Health Network](#)). Also of interest is a series of convenings sponsored by the NIH, in collaboration with the Foundation for the NIH (FNIH) and the Renée Fleming Foundation, to inform creation of a toolkit for studying music-based interventions. An initial focus on brain disorders of aging will anchor the development of the toolkit as a foundation for research across the lifespan (FNIH 2021).

Another forward-looking effort is the Music in Mind Think Tank, which explores music’s role in helping to prevent and treat severe mental illness while bridging

“We have been evolutionarily designed for music to play some kind of survival advantage. . . . What is it that music does for us as a species that might contribute to our survival? If we understood that better we could bring that forward even more effectively to medicine.”

Francis Collins, MD, PhD, director, National Institutes of Health (Aspen Institute 2020)

the gap between research and practice and across different research fields (One Mind 2020).

Importantly, nothing in what has been learned about music suggests that it is unique among art forms in its capacity to advance health and wellbeing. To the contrary, the accumulating evidence only suggests the need to pursue comparable scholarship in other art modalities. In neuroarts, as in most avenues of scientific investigation, virtually every research finding generates new hypotheses to explore and new opportunities to refine knowledge. Within a solid ecosystem, findings can build upon findings to advance the field.

SPOTLIGHT

Sound Health and the Sound Health Network

“Music can get you moving, lift your mood, and even help you recall a memory, but can it improve your health?” The search for an answer led to **Sound Health**, a partnership that brings together Renée Fleming, the National Institutes of Health, and the John F. Kennedy Center for the Performing Arts, in association with the National Endowment for the Arts (NEA) (National Institutes of Health n.d.b). The initiative includes the **Trans-NIH Music and Health Working Group**, an unprecedented collaboration among 23 NIH institutes for the common goal of furthering this field.

Sound Health’s in-depth research agenda is built around four broad areas: basic and mechanistic studies, translational and clinical studies, methods and outcomes, and capacity building and infrastructure. Through a series of funding opportunities, the partners expect to:

- Increase understanding of how the brain processes music.
- Develop scientifically based strategies to enhance normal brain development and function.
- Advance evidence-based music interventions for brain diseases and human health overall.

An additional resource, designed to bring greater research and public attention to music’s biological power, is the **Sound Health Network**, launched in January 2021 (University of California San Francisco Sound Health Network 2021). The NEA has partnered with the University of California San Francisco on this initiative; the NIH and the Kennedy Center are key collaborators. Their goal is to unite stakeholders across disciplines that are committed to exploring the intersection of music, sound, neuroscience, health, and wellness across the lifespan.

The core pursuit of Sound Health and the Sound Health Network is straightforward: a search for knowledge that makes use of the extraordinary power of music to promote health and improve lives.

Many Practitioners, Many Modalities

How do we understand the value proposition of arts to society? Why should institutions and governments invest in the arts? The answers reveal an opportunity to redefine the role of culture, creativity, and connection to improve individual and community health and wellbeing.

As the research base for neuroarts grows, an army of arts practitioners is drawing on an arsenal of modalities to drive practice forward. Validated by a combination of professional experiences and a growing body of quantitative and qualitative evidence, practitioners are applying the power of creative expression to take aim at some of the world's most formidable health challenges. A handful of well-funded, large-scale initiatives and many more smaller, local efforts are addressing disease-specific challenges; community and public health issues; the harms associated with climate change, natural disasters, and migration patterns; and much more.

Developing a comprehensive description of the practices around the globe that fit within the neuroarts ecosystem is a vast undertaking. Indeed, one of the proposed action steps in this *Blueprint* is to create asset maps that describe the full extent of who is doing what. We already know that arts practitioners whose work influences health and wellbeing come from many cultures and backgrounds—their training and experience differ, as do the education and licensing requirements of their professions, and their access to funding and professional assets, such as a journal or discipline-specific association. Practitioners can be found in clinical environments, cultural arts organizations, educational institutions, and other community settings, representing disciplines that include, among others, creative arts therapy, rehabilitation science, community advocacy, education, public health, mental health, social work, architecture, urban planning, social entrepreneurship, app development, and virtual reality.

Hand in hand with traditional medicine, practitioners are using arts interventions to improve gait and balance in individuals with multiple sclerosis (Sonke, Langley, Whiteside, Gyang, et al. 2020); reduce the anxiety associated



with chemotherapy (De Feudis, Graziano, Lanciano, Garofoli, et al. 2019); strengthen muscles in individuals with developmental disabilities (DiPasquale & Kelberman 2018); improve mobility, memory, and speech; relieve the after-effects of trauma and build resilience; enhance learning outcomes; and so much more (See Me Scotland 2020; University of Florida Center for Arts in Medicine 2021b; World Health Organization 2019). A few examples:

- Musicians on Call is bringing musicians to hospital bedsides in 25 US cities (Musicians on Call n.d.), while at the University of Alabama at Birmingham Hospital, dancers, painters, and actors are engaging families in interactive arts experiences (UAB Institute for Arts in Medicine 2021).
- Architects are following design guidelines to make it easier for schools to promote healthy eating (Huang, Sorensen, Davis, Frerichs, et al. 2013), and planners are promoting urban design as a tool to tackle racial disparities in asthma (Newman 2019).
- Through the Porch Light program in Philadelphia, visual artists and behavioral health providers are partnering to guide people dealing with mental health challenges to create meaningful works of public art (Mural Arts Philadelphia n.d.).
- App developers have created tools that draw on the arts to support health and wellbeing, including a set recommended by the Alzheimer’s Family Center for people with dementia (Alzheimer’s Family Center 2019).



- Creative arts therapists are guiding active-duty military service members with symptoms of posttraumatic stress disorder (PTSD) and traumatic brain injury in making masks to represent aspects of their personal experience or identity. By externalizing their emotional states, many participants have found “a way to talk about their unseen wounds and struggle” (Walker, Kaimal, Gonzaga, Myers-Coffman, & DeGraba 2017).
- Practitioners from multiple disciplines are supporting the Cleveland Clinic Arts & Medicine’s commitment to the use of arts in healthcare. In addition to showcasing art throughout the complex, artists across disciplines offer lectures, performances, and workshops; a residency program brings musicians into public spaces; and arts therapists are widely available (Cleveland Clinic Arts & Medicine 2021).

Beyond their capacity to lessen the toll of discrete medical conditions, the arts are playing a somewhat less easily measured—but no less crucial—role in advancing wellbeing, fostering social connection, and forging the stronger, more equitable, and more resilient communities that can grow health (Center for Active Design 2021b; Center for Health Design 2021b; National Assembly of State Arts Agencies 2017; Policy Link 2021; Rose, Daniel, & Liu 2017; Sonke, Golden, Francois, Hand, et al. 2019). (See [Spotlight: Yerba Buena Center for the Arts](#) and [Spotlight: Art in a Box at the Metropolitan Museum of Art](#).)

“For my community, art, song, and picture have always been about healing. It’s at the very core of how we know to be. Without art, my people would have died a long time ago,” said Fariduddin Frederick Johnson, referencing African Americans (Johnson 2020). Johnson is artist in residence at the David A. Straz Jr. Center for the Performing Arts in Tampa, Florida.



“We see evidence that communities that engage residents and have a high degree of social cohesion tend to be healthier than those who do not. Arts are part of the narrative of what makes a strong and healthy community.”

Cara James, PhD, president and CEO, Grantmakers In Health (James 2020)

The art modalities to promote health and wellbeing are as diverse as the populations they serve. For example:

- Music improves cognitive function in people with dementia (Devere 2017), reduces the anxiety associated with cancer (Popkin 2017), relieves symptoms of trauma (Landis-Shack, Heinz, & Bonn-Miller 2017; Sorensen 2015), and improves motor coordination (Thaut 2015; Thaut & McIntosh 2014).
- Early childhood participation in the arts, including music, dance, theatre, and visual arts, can enhance social and emotional development, which builds enduring capacity to handle physical and mental stress. Among other studies highlighted in a literature review, toddlers participating in a music education program demonstrated more social cooperation, interaction, and independence, while drawing helped improve mood. Arts activities were also associated with benefits for special populations, including children with autism (Menzer 2015).
- Dance has beneficial effects on endurance, motor impairment, and flexibility among people with Parkinson’s disease (Shanahan, Morris, Bhriain, Saunders, & Clifford 2015). Among children, dance is associated with increased flexibility, balance, and coordination; muscle development; improved circulation; and greater body awareness, according to an NEA report. Dance can also help children learn spatial concepts, sequencing, and patterns (National Endowment for the Arts 2004).
- Theatre has been used as a therapeutic intervention in pediatric emergency departments and with children who are undergoing MRIs, recovering from

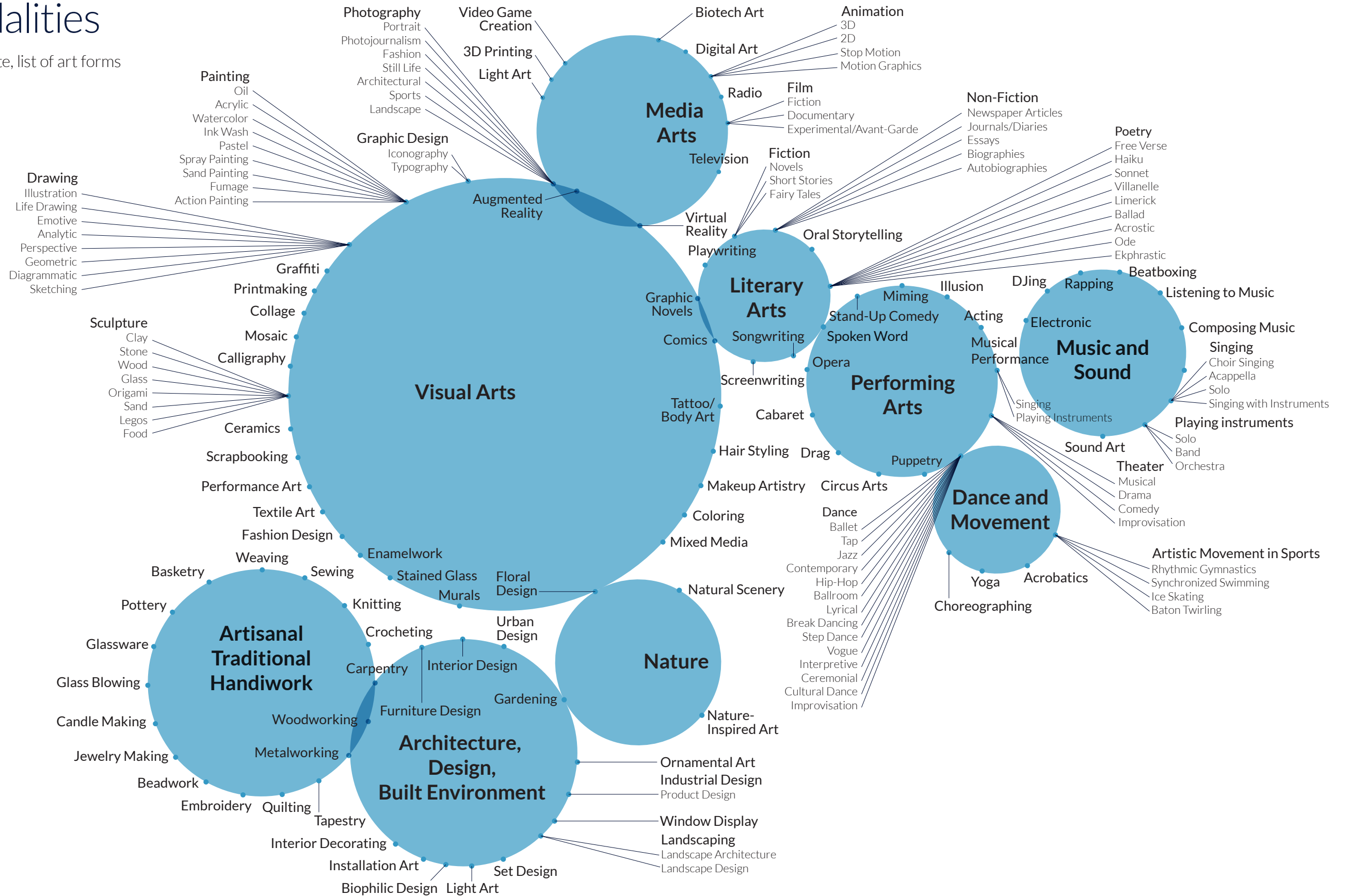


sexual abuse, and facing life-threatening illness (Wall, Fries, Rowe, Malone, & Österlind 2020).

- Painting, drawing, and other visual arts enable individuals dealing with PTSD to express themselves. One systematic review found that art therapy reduced common responses to trauma, such as anxiety, arousal, and depression (Schouten, de Niet, Knipscheer, Kleber, & Hutschemaekers 2015).
- Listening to music reduces pain, lessening the need for potentially addicting medication and improving readiness and motivation to seek treatment, according to a study of arts-based interventions for opioid-use disorders (National Endowment for the Arts 2020).
- Poetry helps both patients and health professionals deal with end-of-life challenges (Davies 2018).
- Architecture, interior design, and urban planning promote healing in the clinic (DuBose, MacAllister, Hadi, & Sakallaris 2018; Healthy Places by Design 2021; Heller 2018; Huisman, Morales, van Hoof, & Kort 2012),

Art Modalities

A vast, but incomplete, list of art forms



reduce stress among health providers (Center for Health Design 2021a; Connellan, Gaardboe, Riggs, Due, et al. 2013), enhance workplace wellness (Center for Active Design 2021a; Colenberg, Jylhä, & Arkesteijn 2019; Timm, Gray, Curtis, & Eun 2018), and increase physical activity in the community (Giles-Corti, Foster, Koohsari, Francis, & Hoopoe 2014).

- Virtual reality generates changes in the limbic and visceral brain circuitry (*ChildArt* 2017) and reduces pain in hospitalized patients, especially those experiencing severe pain (Spiegel, Fuller, Lopez, Dupuy, et al. 2019).

(See [Spotlight: Meeting Community Needs](#) for other population-specific examples.)

Global findings further underscore the health value of arts practices. A United Kingdom government report concludes that the arts can help to prevent or treat disease, based on findings from research and roundtable discussions with patients, healthcare and social care providers, artists and arts administrators, academics, local government representatives and ministers, and Members from both Houses of Parliament. Among other findings, the report notes the role of the arts in managing chronic health conditions, supporting healthy aging, improving sleep, reducing epileptic episodes, enhancing mental healthcare and experiences of trauma, and increasing wellbeing among healthcare staff (All-Party Parliamentary Group on Arts, Health and Wellbeing 2017).

Australia, Canada, and New Zealand have paid particular attention to the ways in which the arts are deeply integrated into the healing traditions of Native peoples. Citing dramatic disparities among Indigenous populations in Canada, for example, one report suggests that “creative and cultural expression can promote community strength and resilience, in turn contributing to improved health outcomes” (Muirhead & de Leeuw 2012).

At a convening of New Zealand stakeholders held to inform this *Blueprint*, participants affirmed the significance of understanding cultural context. “It’s important to acknowledge that when people are engaging with the arts, they are coming with both a personal history and a cultural history, and their reaction to the arts will depend very much on both of these, and of course the current context,” said David Bilkey, PhD, director of brain research at the University of Otago in Dunedin, New Zealand. “If we take cultural context out of the equation, we’re really not going to understand what’s going on” (Bilkey 2021).

An expansive view of arts practice also emerges from recent interest in social prescribing (see [Spotlight: Using the Arts as Part of Social Prescribing](#)). A social prescription is a referral, typically by a clinician in a primary care setting, to nonmedical community-based resources in order to meet social, emotional,

financial, or other needs that impinge on health and wellbeing. “As an effective antidote to physical and psychological pain, arts participation forms a vital part of social prescribing,” states a United Kingdom report (All-Party Parliamentary Group on Arts, Health and Wellbeing 2017).

Social prescribing recognizes the sometimes-indirect relationship between the source of a problem and its physical manifestations and the influence of a host of social and economic factors (“social determinants of health”) on health outcomes (World Health Organization 2021c). Still in its infancy, the broader use of social prescribing is likely to await more definitive evidence of impact (Husk, Elston, Gradinger, Callaghan, & Asthana 2019). But United Kingdom researchers have already identified some specific ways in which arts-related activities can target nonmedical drivers: “Arts engagement can mitigate the social determinants of health by influencing perinatal mental health and child cognitive development; shaping educational and employment opportunities and compensating for work-related stress; building individual resilience; and enhancing communities” (Gordon-Nesbitt 2020).



SPOTLIGHT

Yerba Buena Center for the Arts

The **Yerba Buena Center for the Arts (YBCA)** is located in the heart of Yerba Buena Gardens in San Francisco, a neighborhood that was once home to the Ohlone Tribe and later the largely elderly and Filipino residents who were displaced in the decades that ran from the 1960s to the 1990s as the 22-acre Yerba Buena Gardens project was developed. The neighborhood has variously been an industrial tract, the domain of single-room-occupancy hotels, a mecca for gay life, and a community of activists. YBCA strives to be accountable to this history, celebrating these vibrant communities and their important contributions to city life. Declaring culture to be an essential catalyst for change, YBCA is playing a leadership role in “forging radical partnerships and reimagining structures to center artists as essential drivers of health and wellbeing in their communities” (Cullinan 2020).



As “a creative home for artists and communities to advance equity, health and wellbeing,” YBCA has formed partnerships with schools, community-based organizations, policymakers, teaching artists, youth leaders, and others to “generate culture that moves people.” Among its activities is the creation of an elementary school curriculum in the dense Tenderloin neighborhood, where violence and drug use are prevalent and access to healthy food and green space is minimal. The curriculum centers on community memory and the core role of food in culture, using the arts and community gardening as their primary tools. YBCA has also partnered with the city’s Office of Economic and Workforce Development on the San Francisco Creative Corps, which employs artists to bring joy and inspiration to people during the coronavirus pandemic, combating social isolation and cultivating cohesion and belonging.



SPOTLIGHT

Art in a Box at the Metropolitan Museum of Art

Recognizing that art can be as nourishing to homebound older adults as a healthy meal, the Metropolitan Museum of Art and Citymeals on Wheels have partnered to deliver them both to New York City residents. Every month, more than 1,000 clients receive “**Your Met Art Box**” along with a food package, and then interact with Citymeals volunteers whom Met educators have trained to facilitate engaging conversations about art. Each themed box features information about selected art masterpieces, sensory-stimulating content (such as incense and an incense burner to highlight the relationships among art, scent, and culture), and do-it-yourself art materials

(such as supplies for designing and creating a paper fan for the Summer in New York City theme).

“Art has the power to heal communities,” said Heidi Holder, who holds the Frederick P. and Sandra P. Rose Chair of Education at the Met. “These conversations between Citymeals volunteers and older adults centered around these masterpieces strengthen connections between people.” While COVID has shifted the project online, volunteers will return to in-person visits once it is safe to do so, with the aim of decreasing social isolation and promoting overall wellbeing (Metropolitan Museum of Art 2021).



SPOTLIGHT

Meeting Community Needs

These examples look at arts practices through the lens of the populations they serve:



Children in refugee camps.

From Bosnia to Palestine, East Africa to Southeast Asia, and most recently in Lebanon, the world-renowned composer and musician Nigel Osborne has introduced **music as therapy** to children traumatized by war and violence (Ambler n.d.). In an **interview** about his work, Osborne commented, “We have seen the powerful effects that the work could have on children—in their presentation, mood, motivation, socialization, and in simple things like sleeping better” (Morris 2018). Working with biologists, psychologists, and musicians, Osborne’s *biopsychosocial* model describes how music supports cognitive development in children.

Survivors of gender-based violence.

Working at the intersection of arts and social action, **Gibney** offers Move to Move Beyond workshops to support individuals and families who have been in abusive relationships (Gibney n.d.). The New York City-based program uses movement and creativity to foster self-awareness, enhance decision-making capacity, promote connections with peers, reduce stress, and enhance self-care. A two-year research study, conducted in partnership with Teachers College at Columbia University and the Sanctuary for Families, and funded by the NEA and the Laurie M. Tisch Illumination Fund, is examining the impact of movement on those affected by intimate partner violence.



Youth in urban areas.

Committed to using the arts as a pathway to equitable community development, the **Sweet Water Foundation** has drawn artists of color to a four-block area on the South Side of Chicago (Sweet Water Foundation n.d.). Working



with local residents, they are transforming spaces, objects, and experiences in culturally relevant ways; providing intergenerational arts and culture programming; and offering a “communiversity” as an alternative to traditional internships, allowing undergraduate and graduate students and recent graduates to grapple with academic theory in the face of real-world problems. In the COVID era, the project is “on the ground dealing with the realities of weights and layers of stress,” said the foundation’s cofounder and executive director, Emmanuel Pratt, MSAUD.

People with dementia.

Artful: Art and Dementia, an initiative of the Museum of Contemporary Art Australia, uses trained artist educators to foster connections and enrichment for people living with dementia. As one program evaluator commented, “I have witnessed a sparkle in the eyes of many people living with dementia as they engaged in artmaking, enabling them to discover parts of their brain that have likely laid silent for some time” (Museum of Contemporary Art Australia 2021).



SPOTLIGHT

Using the Arts as Part of Social Prescribing

United Kingdom

Artists and cultural organizations have helped to drive a strong grassroots movement to include the arts in social prescribing activities. Among the programs to which clinicians are making referrals:

Artlift Gloucestershire

With creativity, not technical skills, as their primary focus, trained artists guide participatory arts sessions that include painting, drawing, illustration, photography, and printmaking and are designed to support adults living with mental health challenges or chronic conditions. An evaluation by the University of Gloucestershire measured improvements in anxiety, depression, and markers of wellbeing (Artlift n.d.).



Dance to Health

Launched in Oxfordshire and designed to prevent falls among older people, Dance to Health was originally offered to local groups and transitioned online with a national reach during the COVID-19 pandemic. An evaluation by Sheffield Hallam University found that the program reduced falls by 58 percent, accompanied by a potential cost saving of £158 million to the National Health Service (Dance to Health 2020).

Manchester Museum's and Galleries Partnership

Through an Arts and Culture on Prescription Program, artists and practitioners offer creative writing, craft workshops, and drawing “to combat social isolation, foster creative learning, improve personal health and happiness . . . and support creative activity, inspiration and stimulation.” The program earned two awards from the Royal Society for Public Health (Foster 2019).

United States

Although much of the United States has been slow to embrace social prescribing, Massachusetts and Rhode Island have taken the lead.

CultureRx Initiative, Massachusetts: The state's CultureRx Initiative is committed to building “a public infrastructure that supports the role of cultural experiences as a protective factor in the health and wellbeing of all people.” Through statewide pilot programs, physicians, social workers, teachers, and others can write prescriptions for cultural engagement, with the organizations reimbursed by the Massachusetts Cultural Council for the services they provide. Arts groups representing many modalities are accepting social prescriptions, including the Enchanted Circle Theatre, Urbanity Dance, Community Music Center of Boston, and Massachusetts Museum of Contemporary Art (Mass Cultural Council 2021).



State Arts and Health Plan, Rhode Island: The Rhode Island Department of Health and the State Council on the Arts have partnered to support development of a State Arts and Health Plan. While a discrete social prescribing strategy has not yet been articulated, the plan includes “a set of policy, practice and research recommendations for advancing the integration of arts and health into interdisciplinary and inter-institutional practice, insurance reimbursement and healthcare workforce transformation” (Rhode Island State Arts and Health Plan 2019).





Vibrant yet Diffuse: A Field Ready to Coalesce

NeuroArts Today: The State of an Emerging Field, a background paper prepared for the NeuroArts Blueprint initiative, provides a point-in-time snapshot of existing scientific research and arts practices, which are widespread but diffuse: “Neuroarts is everywhere—yet nowhere,” the paper states. “There is a ferment of activity and vigorous growth in the field, but knowledge, practice, education, policy, and financing are deeply fragmented” (NeuroArts Blueprint Initiative 2021b).

A Sampling of Key Supporters

A brief review underscores the extent of the work and the potential synergies:

In the United States, the National Institutes of Health and the National Endowment for the Arts are leading federal efforts, dedicating substantial resources to various arts-related research and practice efforts (see [Spotlight: Sound Health and Sound Health Network](#) and [Spotlight: Neuroarts and the NEA](#)). The National Science Foundation is helping to sponsor an interdisciplinary workshop focused on creative movement and the brain, and state and local government agencies are engaged through arts councils and agencies, artists-in-residence programs, and social prescribing.

An institutional collaboration between the National Academies and the Association of American Medical Colleges, developed to consider the role that the arts and humanities can play in medicine, medical education, and clinician wellbeing, is also of interest (National Academies of Sciences, Engineering, & Medicine 2020). Another effort is BrainMind, a “private community of top brain scientists, entrepreneurs, investors, philanthropists, and academic institutions” which includes arts in its mission to accelerate innovation in brain science (BrainMind n.d.).

On the global stage, the World Bank, through its Art Program, has also been an enthusiastic proponent of policies that advance the link from the arts to health to economic wellbeing. [Human Capital and the Arts at the World Bank Group](#), the paper commissioned for this initiative, makes the case that health is a fundamental ingredient of human capital and that arts-informed economic interventions are

“Engaging with creative and artistic activities has a proven track record of improving individual and population health—from increased emotional regulation and social connections and improvements in cognitive capabilities and meaning-making to alleviating pain, reducing anxiety, and facilitating healing processes. Those health benefits, in turn, are deeply linked to economic performance, in part because people are more productive when they are healthier.”

Human Capital and the Arts at the World Bank Group (Biondo, 2020)

a health-building tool. The paper profiles seven World Bank-funded initiatives, from Afghanistan to Venezuela, to illustrate the role of the arts in social cohesion, mental health, adolescent development, and violence prevention, among other issues (Biondo, Vakis, & Dalton 2020).

Creative New Zealand (Creative NZ 2021) and the Arts Council England (Arts Council England n.d.) are two international examples of government commitments to elevate the arts as a tool for cultivating health and wellbeing. Another global call for strengthening that link comes from WHO in its Health 2020 policy framework, which has been adopted by all 53 countries in the WHO European region (World Health Organization Regional Office for Europe n.d.).

WHO has ramped up its work in the field, establishing the WHO Arts & Health Program in 2019, which “supports the research agenda of the health benefits of the arts and creativity.” Through collaborations with community arts-based

health interventions, global media, and national policymakers, the program’s aim is “to foster a virtuous cycle of experience, evidence, learning, communication, and global leadership to improve the health and wellbeing of all.” WHO’s Healing Arts Initiative, launched as a response to COVID in November 2020 with a focus on mental health, has been broadened to pursue the goal of “making arts and health a mainstream thread of society and policy” and “leading a Healing Arts revolution that improves the wellbeing of millions of people” (World Health Organization 2021b). Also planned is a dedicated lab to generate the compelling scientific evidence needed to influence global policy (see [Spotlight: WHO’s Healing Arts Lab](#)).

To mention some of the many professional organizations involved in neuroarts is admittedly to risk omitting others, but the degree of engagement is striking. Some professional associations—such as the National Organization for Arts in Health (NOAH) and the Art Therapy Alliance—are exclusively dedicated to showcasing the links between the arts and health. Many other organizations understand that neuroarts plays a role in their work, whether their core mission is health (e.g., the American Medical Association, American Academy of Pediatrics, American Psychological Association, and American Congress for Rehabilitation Medicine), the arts and aesthetic experiences (e.g., the Academy of Neuroscience and Architecture, Alliance for the Arts in Research Universities, American Alliance of Museums, and Americans for the Arts), or special populations (e.g., AARP, which advocates for people age 50 and older, and the National Education Association, which represents teachers).

Momentum is also evident in education:

- The Center for Arts in Medicine at the University of Florida offers a package of coursework and the opportunity to pursue undergraduate and graduate certificates or a master’s degree in arts in medicine (see [Spotlight: Center for Arts in Medicine, University of Florida](#)) (University of Florida Center for Arts in Medicine 2021b).
- The New York University Creative Arts Therapies Consortium is an international research alliance of eight universities in five countries—Australia, Germany, Israel, the United Kingdom, and the United States—that offers doctoral programs in creative arts therapies. Its mission is to collaborate on research and support new researchers in the field (NYU Creative Arts Therapies Consortium International Research Alliance 2021).
- The Arts in Health Institute has developed self-paced, interactive multimedia curricula designed for both personal and professional development, including tools that target mental health workers and others in the helping professions (Arts in Health Institute 2021).

- *The Fundamental Role of Arts and Humanities in Medical Education*, commissioned by the American Association of Medical Colleges, explores the role of arts and humanities to help physicians and trainees “learn to be better observers and interpreters; and build empathy, communication, and teamwork skills” (American Association of Medical Colleges 2021).
- The Academy of Neuroscience for Architecture tracks certificate programs and individual courses that link neuroscience research to human responses to the built environment. An example is the postgraduate program at the Università luav di Venezia, in Venice, Italy, available to students “who wish to intertwine lessons from architecture, cognitive science and neuroscience” (Academy of Neuroscience for Architecture 2021b).

Another educational resource is the *Core Curriculum for Arts in Health Professionals* of the National Organization for Arts in Health, published in late 2021.

The curriculum was developed to offer a “basis for academic course work, institutional and continuing education training, as well as community workshops” (National Organization for Arts in Health 2021). The organization has called for incorporating elective courses, such as arts and healthcare design and managing art collections in clinical settings, into university art, architecture, and arts administration degree programs. Beyond the educational setting, NOAH is also helping to define standards of practice and credentialing for professional artists, arts administrators, and arts consultants in healthcare settings.

Complementing these institutional efforts to inform and scale neuroarts are the countless community-based organizations that are relentlessly centering arts as a pathway to wellbeing. Driven by a commitment to culture change and tied together by the threads of resilience and the goal of equity, they typically occupy only a small patch of local ground. Cumulatively, however, they are powerhouse contributors to the field.

SPOTLIGHT

Neuroarts and the NEA



The National Endowment for the Arts has made significant investments in neuroarts, as these activities highlight:

- The **Federal Interagency Task Force on the Arts & Human Development**, convened by the NEA, brings together multiple federal agencies to encourage more and better research on how the arts can help people reach their full potential at all stages of life (Arts & Human Development Task Force n.d.).
- **Creative Forces**[®] is an NEA initiative in partnership with the U.S. Departments of Defense and Veterans Affairs that places creative arts therapists at the core of patient-centered care at clinical and telehealth sites throughout the country. It also increases access to community arts activities that promote health, well-being, and quality of life for military and veteran populations exposed to trauma, as well as their families and caregivers. Creative Forces is managed in partnership with Americans for the Arts, the Henry M. Jackson Foundation for the Advancement of Military Medicine, and Mid-America Arts Alliance (MAAL). In September 2021, the NEA and MAAL announced a new Creative Forces Community Engagement Grants program (National Endowment for the Arts n.d.a).
- The **NEA Research Labs** provide grants to interdisciplinary academic teams across the country to support research into a wide range of issues related to arts, health, and neuroscience. These awards are generally sorted into two broad topic areas: “arts, health, and social/emotional wellbeing” and “arts, creativity, cognition, and learning” (National Endowment for the Arts n.d.b). The EpiArts Lab is one such lab, dedicated to “exploring the impact of arts and cultural engagement on population health outcomes” (University of Florida Center for Arts in Medicine 2021c). A partial list of other NEA Research Labs whose work falls within the scope of this report includes teams at Arizona State University, Drexel University, Rice University, University of California–San Diego, University of California–San Francisco, University of Colorado–Denver, and Vanderbilt University Medical Center.
- Additional funding opportunities are available through the NEA’s **Research Grants in the Arts** program, which supports investigation into the value and impact of the arts (National Endowment for the Arts n.d.c). Several of the NEA’s research grants and labs support randomized controlled trials and other studies that explore the relationship of the arts to positive health and human development.
- See **Spotlight: Sound Health and Sound Health Network** for a description of the **Sound Health Network**, a partnership between the NEA and the University of California–San Francisco, in collaboration with the NIH and the Kennedy Center.

SPOTLIGHT

Center for Arts in Medicine, University of Florida



The **Center for Arts in Medicine, University of Florida** sees its role as providing “a framework for interdisciplinary collaboration among University of Florida faculty and students, healthcare providers, clinical artists, and the local and global communities” (University of Florida Center

for Arts in Medicine 2021a). The center’s mission is to advance local and global arts in health research, education, and practice.

“Medicine can do extraordinary things today,” said Jill Sonke, the center’s director. “And with the arts, it can do more.” Sonke and her colleagues developed the nation’s first degree programs in arts in health, and the University of Florida now offers a master of arts in arts in medicine, two graduate certificates, and four undergraduate certificates. Among the courses:

- Creativity and Health: Foundation of Arts in Medicine
- Arts in Medicine in Practice
- Collaborations across Disciplines: The Arts Therapies
- Art and Design in the Environment of Care
- Arts in Public Health Practicum

The school also offers a combined bachelor’s and MA degree open to students majoring in music, public health, microbiology, chemistry, or psychology.



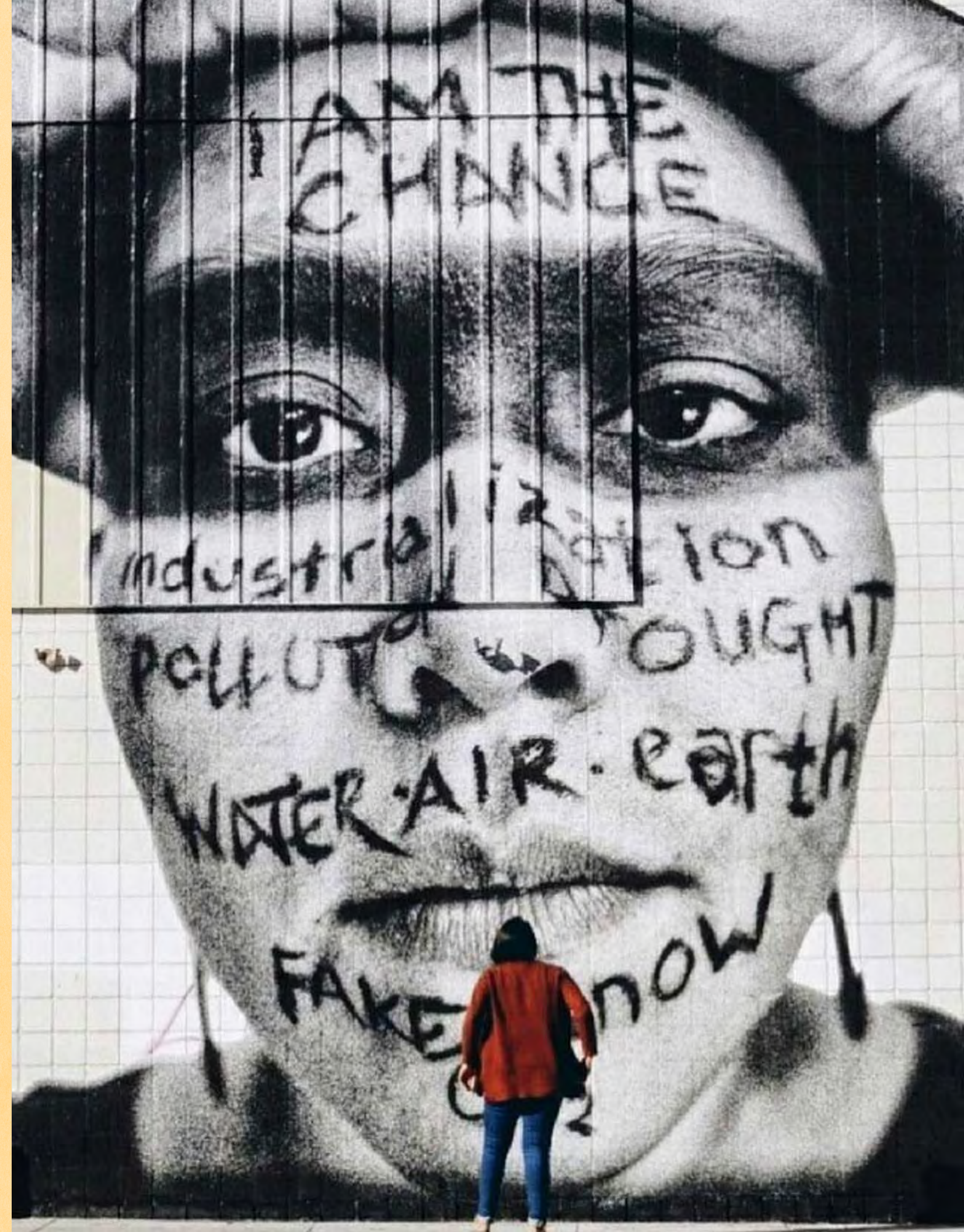
SPOTLIGHT

WHO's Healing Arts Lab

In September 2021, the World Health Organization launched a Healing Arts Lab “to generate compelling scientific evidence, influence global policy, and radically improve healthcare worldwide.” The program is structured to bring together three core components within and outside WHO to promote the health and healing roles of the arts:

- **Research:** Academics working within WHO-accredited universities and research centers produce rigorous studies to assess the measurable impact of arts interventions designed to improve health.
- **Outreach:** Advocacy through high-profile events and media campaigns increase public engagement and drive stakeholder buy-in, in turn supporting further funding, research, and policy implementation.
- **Policy:** WHO-led advocacy drives policy discussions and implementation across 193 member state governments and civil society.

With sufficient funding investments, these interacting pieces are intended to change the narrative about arts and health, scale the impact, and ultimately improve the system.



The Impediment of Fragmentation

Significant fragmentation diminishes the vibrancy of neuroarts. Lacking opportunities to overlap in professional circles, scientists and practitioners are frequently unfamiliar with the idioms, priorities, and norms of one another's fields. The community voice is too often left out of the equation altogether, and policy, funding, and messaging strategies are developed piecemeal, if at all. Until there is a fully built-out ecosystem to bring stakeholders together, the cross-fertilization so critical to progress cannot occur at scale.

"In order to create a field, you need people to understand that we're all working within the same system," emphasized Jamie Bennett, executive director of the now-sunsetted ArtPlace America. That understanding is lacking right now.

"There is not a movement that is consistent with the developing science to move the field along. There are just a lot of people talking separately and a lot of wasted resources because there are pockets all over the country, all over the world, of people who are interested in this and working towards it, but not communicating with one another."

Sarah Lenz Lock, JD, senior vice president, Policy & Brain Health, AARP (Lock 2020)

At the same time, most of the promising findings and potentially replicable case studies are based on relatively small populations and have a limited scope. Published research too often remains within the confines of a single discipline, and lack of communication results in duplicative studies and prevents discovery from building on discovery, limiting generalizable conclusions and the opportunity to scale. Often, academic journals are out of reach to populations who could apply their findings, either because of the cost to access them or because they are too technical in nature.

"Scientists, practitioners, and technology pioneers are already working at the edges of innovation in their own fields to elevate the arts as essential to wellbeing. But they have too often been siloed."

Michael Paseornek, producer and former president of Motion Picture Production at Lionsgate; cochair, NeuroArts Blueprint Advisory Council (Paseornek 2020)

Framing assumptions and lack of consistent language are fundamental barriers to the collaborations essential to culture change. Basic terms like "health," "wellbeing," and "the arts" are laden with values that reflect context, culture, and history, but these influences too often go unrecognized or unacknowledged. The greater worth that is sometimes assigned to certain disciplines, experiences, or sources of knowledge over others often reflects implicit bias, and myths abound about who can make art and what its value is. To foster effective communication, stakeholders need to confront assumptions they may not even realize they hold and reach consensus on broad, inclusive definitions.

More narrowly, there is no agreed-upon terminology for talking about neuroarts itself. Many other terms are in use, including *neuroaesthetics*, *empirical aesthetics*, *healing arts*, *art therapy*, and *arts in health*, each reflecting a different evolution, constituency, and emphasis. There is no consensus as to whether *neuroarts* is the right umbrella term to bring all of them together, and it is not yet in widespread use. In the *Blueprint* survey, fewer than one-third of respondents

said they had significant knowledge of what *neuroarts* means, including those who are engaged in some aspect of arts and health. Yet once the term was defined for them, most respondents said that their work was, in fact, part of the field (Lake Research Partners 2021). While we have adopted *neuroarts* as our catchphrase for purposes of this *Blueprint*, we make no claims regarding its long-term utility.

Fragmentation: Research

Neuroarts research is conducted within multiple disciplines that rarely intersect—including neuroscience, neurology, psychology, psychiatry, education, nursing, public health, pediatrics, and social science. The heterogeneity in taxonomy, study protocols, and outcome measures complicate any effort to analyze evidence, compare results, or build a common platform. There is a paucity of traditional, placebo-controlled clinical trials to demonstrate the efficacy of arts interventions for a range of disorders and even less consensus on innovative research designs that meet the threshold for rigor while factoring in the unique challenges of studying the arts in all their complexity.

Consider the many methodologies used in WHO’s 3,000-study synthesis of the global literature on arts and health: “uncontrolled pilot studies, case studies, small-scale cross-sectional surveys, nationally representative longitudinal cohort studies, community-wide ethnographies, and randomized controlled trials from diverse disciplines. Research methods included psychological scales, biological markers, neuroimaging, physiological assessments, behavioral observations, interviews, and examinations of clinical records” (World Health Organization 2019).

In its literature review, *NeuroArts Today* uncovered the same thing. Here, too, language was cited as a challenge; the many words used to name the fields associated with neuroarts each place differing levels of emphasis on basic and translational science and on clinical and community practices. A search for the term “neuroaesthetics,” for example, returns a majority of its results in the fields of psychology and neuroscience, while a search for “arts in health” suggests that education is the dominant discipline in which the work is taking place (NeuroArts Blueprint Initiative 2021b).

Further evidence that research is far from coalescing comes from a qualitative analysis of a series of interdisciplinary focus groups conducted at Johns Hopkins’s IAM Lab (Golden, Tetreault, Ray, Kuge, et al. 2021). The participating thought leaders in that study discussed only a tiny slice of the neuroarts field:

research related to a single modality (music) to treat one category of disease (serious mental illness). Yet even within that subset, their discussions revealed extensive barriers to bringing disciplines together.

Summarizing the challenge, the authors wrote, “Disciplines involved in music and mental health research vary not only in how they define terms, but also in their selected outcomes and outcome measures, and in their practices for conducting and reporting research. This variety limits researchers’ and practitioners’ ability to synthesize evidence, generate shared best practices and clinical practice guidelines, and promote relevant policies” (Golden, Tetreault, Ray, Kuge, et al. 2021). Focus-group participants decried the lack of structure and incentives to connect disciplines, the lack of common reporting guidelines, and inconsistent methodological approaches. Analyses of their discussions also revealed differing standards of rigor and power imbalances and tensions across sectors and disciplines.

The fragmentation in academic settings is intensified by the exclusion of many community-based arts programs from the research conversation. Their lack of access to reliable assessment tools can be a barrier to securing resources and disseminating results, with significant equity implications for the field. In some instances, partnerships with evaluators can fill the gap, but many local programs are not comfortable conforming to research standards that have been defined in other settings to meet needs that differ from their own. Their determination to think differently about the nature of evidence and measures of success can inform ideas about what works, but too often their authority and expertise have been curtailed by hierarchies of influence.

Fragmentation: Practice

Like research, arts practices that influence health and wellbeing are decentralized. From the bedside to the clinic—and across myriad community settings and the broad sweep of the built environment—practitioners work across many fields but know little about results being achieved elsewhere.

Siloed within their own disciplines, professional associations generally don’t talk to one another; opportunities for cross-fertilization are minimal. Because they are not steeped in the scientific foundation of what they do, practitioners frequently experiment and innovate alone, observing results that go unshared. While some of their work has been formally evaluated, much has not been. Without systematic support or interest from the research community, practitioners’ influence rarely matches their dedication and knowledge.

Any attempt to develop a taxonomy of the arts practices used to advance health and wellbeing is complicated by classifications that are already in use. Though many are practical, none is comprehensive or universally accepted. The National Organization for Arts in Health, for example, delineates three major groups of health-practice professionals who support “arts, health, and wellbeing in America” (National Organization for Arts in Health 2017):

- **Creative arts therapies:** “The distinct, regulated health professions of art therapy, dance/movement therapy, drama therapy, music therapy, poetry therapy, and psychodrama therapy.” These are board-certified fields, with clearly defined standards of practice and educational requirements, each using a specific art form and delivery method as treatment. These fields are rooted in the belief that each form of therapy has limited therapeutic value unless it is administered under precise protocols and conditions.
- **Expressive arts therapies:** Defined as “the integration or use of all the arts in therapeutic practice. . . . Practitioners are trained to combine two or more art forms in clinical practice.”
- **Arts in health programs:** Located within medical centers and other healthcare institutions, these include “visiting artists, artists-in-residence, arts programming developed in partnership with community arts agencies, arts collections, and rotating arts exhibits.”

Though that list is lengthy, these practices represent only a subset of a subset within the neuroarts ecosystem. NOAH itself recognizes a broader continuum in the use of the arts by “professionals in affiliated arenas like medical humanities, healthcare design, occupational therapy, recreational therapy, life enrichment services, child life services, and arts for people with disabilities and those with chronic illness.” And even that list is far from complete, centering only on clinical settings and barely hinting at the broader sweep of community practice.

Fragmentation: Infrastructure

If research and practice are characterized by a vast, albeit disconnected body of work, the infrastructure needed to cultivate the neuroarts field is far less developed. A brief look at the limited reach of education, policy, and funding structures illustrates the degree of fragmentation.

Education: Much of the basic science of perception, sensory systems, cognition, and neurological processes that contributes to an understanding of neuroarts is carried out under the disciplines of neuroscience, cognitive neuroscience,

neurology, behavioral science, public health, and psychology. Here, academic and career pathways are relatively well established, although independent of one another. Opportunities are sparse for the transdisciplinary and extradisciplinary training that would expose students in any of these disciplines to the broader neuroarts landscape, diversify the field, and bridge basic, translational, clinical, and community-based research.

Training is also disconnected within the realm of arts practices. For example, there are distinct academic and coursework requirements within each of the creative art therapies, while entirely different standards exist for the social workers, psychologists, rehabilitation specialists, and public health practitioners who might use the arts in their work. The biological underpinnings of art have not been integrated into most of this training, nor has there been much focus on building the skills needed to conduct neuroarts-related research. Whether they have advanced along traditional academic paths or not, many people who connect with the neuroarts field in some way—including artists, community advocates, and activists—have rich on-the-ground experiences that can inform and advance research, yet no forum through which to share it.

As noted, many colleges and universities offer relevant certificate and degree programs at the undergraduate, master’s, and doctoral levels, but once again these opportunities are diffuse. Without a shared vision, common language, or exposure that integrates science and practice in academic settings, students spend their time in siloes and then start their careers knowing little about other disciplines that could enrich their work and advance the field.

Policy: Conflicting policy priorities and resource limitations are worldwide challenges, affected to varying degrees by differences in relevant government structures, the degree of public support for the arts, and the ways in which health systems operate. While policies are being implemented in some locations, they are not generally widespread or systematic, and there are no mechanisms to share strategies.

In the United States, policies to support or expand the neuroarts ecosystem—including public sector commitments to pilot and evaluate programs, and requirements for insurance reimbursement—are in particularly short supply. As *NeuroArts Today* documents, the enormous public investments that have shed light on how the brain and body respond to stimuli have yet to be matched by commitments to apply that knowledge to arts practices in clinical and community settings (NeuroArts Blueprint Initiative, 2021b).

Where arts interventions target specific medical conditions and can be linked directly to outcomes, the argument for supportive policies and funding is

“To the extent that policy conversations about neuroarts occur at all, they typically take place in a scattered fashion. The value proposition of the arts to American society remains underrecognized, hobbled in part by the lack of return-on-investment data or a compelling economic model.”

NeuroArts Today (NeuroArts Blueprint Initiative 2021b)

somewhat easier to make (although that is still a stretch of norms, at least in the United States). Fewer structures exist to support the harder-to-quantify—but no less valuable—application of the arts and aesthetic experiences to advance overall health and wellbeing or to influence social determinants of health, such as education, housing, employment, transportation, social justice, and racial equity. Across the many government departments and agencies with authority in those realms, there is little understanding, and even less consensus, about the potential contributions that the arts can make.

In the United States, a long-standing tradition of undervaluing creative pursuits is a further barrier. Impediments also include a fragmented system of health coverage, the difficulty of bringing siloed government agencies together, and the complexity of congressional appropriations processes.

Funding: Limited funding is a potent barrier in all corners of the neuroarts field, as respondents to the *NeuroArts Blueprint* survey attest; more than 90 percent called lack of funding a primary challenge to collaborations (Lake Research Partners 2021). The transdisciplinary and extradisciplinary nature of neuroarts means that research activities do not fit readily within the mission of a single federal agency, yet interagency cooperation is often difficult to secure. While discretionary funding within the NIH and NEA has enabled research to move forward, the absence of an intentional, large-scale commitment of public funds makes clear that Congress has yet to identify the field as a priority.

On the practice front, interventions are disproportionately dependent on philanthropic funders, which are typically nimbler than government funders but also tend to be walled off from one another. Moreover, even well-endowed philanthropies lack the vast resources of the public sector and are more likely to shift grantmaking priorities over time, a challenge to the funding stability that allows research and practice to flourish.

Although insurance reimbursement would likely be a key motivator for expanding the field, coverage for arts-related health interventions is inconsistent and limited in the United States. This approach stands in contrast to national healthcare systems in Australia, Canada, New Zealand, and the United Kingdom, which do have mechanisms in place to pay for such services.

In the United States, “mental health and substance use disorder services” are considered “essential health benefits” under the Affordable Care Act and are thus reimbursable (Baumgartner, Aboulafia, & McIntosh 2020). This creates a potential pathway for using the arts to treat PTSD, dementia, depression, and other mental health challenges, but the requirements for substantiating “medically necessary” services are often burdensome or poorly defined. And while a patchwork of state-level systems allows for some coverage—for example, licensed creative art therapists in Maryland are reimbursed on an equal basis with other mental health professions (American Art Therapy Association 2017)—insurance approval for arts-related therapy is generally decided on a case-by-case basis. Most support for using the arts to advance health and wellbeing comes instead either through grants that have little guarantee of continuity or private-pay arrangements, which makes them difficult to scale.

“Can our work here bridge the gap between the way that doctors and other scientists think about health and the way artists think about wellbeing?”

David Leventhal, Dance for PD, Mark Morris Dance Group



Confluence of Science and the Arts

Overcoming fragmentation starts with recognizing that scientists and arts practitioners are equal partners. Both groups are skilled at asking provocative questions that can generate valid learnings, and together they have a multiplier effect that drives innovation on behalf of individual and community health and wellbeing.

But the two sectors do not always pair seamlessly. This reflects, at least in part, structural issues related to differentials in power, funding, and status that need to be confronted in order to create a level playing field.

In the world of science, peer review is paramount, and hierarchies of evidence are well established; randomized controlled trials are considered the gold standard, with consistent, reproducible results the goal. A time-honored process of hypothesis, experimentation, observation, and conclusion drives the work of scientists.

“We need objective data demonstrating the efficacy of the arts in helping those with brain disorders under specific circumstances,” asserted Eric Nestler, MD, PhD, director of the Friedman Brain Institute at the Icahn School of Medicine at Mount Sinai, and cochair of the NeuroArts Blueprint Advisory Council. Yet Nestler welcomes new approaches to evaluating neuroarts. “We need to do this in a way that effectively captures the interest, needs, and participation of the broadest audience possible, rather than just sticking with the standard types of randomized clinical trials that academics are used to. There are now more innovative ways in which we can obtain objective, compelling data.”

Community-based participatory research is one of the innovations helping to usher in a new generation of scholarship that is at once rigorous and flexible (Policy Link 2012). Guided by what a community wants to learn from neuroarts, equitable collaborations can be designed that involve arts practitioners, healthcare consumers, and other community stakeholders as participants, research subjects, or fully integrated co-researchers. By recognizing local assets and generating actionable knowledge, community-based participatory research provides a strength-based tool for building evidence.

Whatever the research design, arts practitioners typically welcome an alignment with science and the opportunity to understand how the body and brain respond to neuroarts and aesthetic experiences. Whether they are trained in traditional evidence-gathering techniques or not, most recognize that shining a light on the biological underpinnings of what they do is a way to enhance their practices and broaden support.

Having witnessed what he calls the “resonance of reconnection” in grassroots efforts to rebuild a Chicago neighborhood, Emmanuel Pratt of the Sweet Water Foundation is a strong advocate for connecting to the world of neuroscience. He sees a transformative response to art in the populations with whom he works and hungers to broaden the research base that explains it. “When that music is played and the connection is seen through the eyes and the smile happens and there’s a whole transformative process, we can affirm that over and over,” he said. “But we do not have the means, technology, or support to critically analyze and translate what’s happening in the brain in real time.”

“We know what the healing is, we know the humanity of it. But we have not bridged the gap to understand it from the brain science world.”

Emmanuel Pratt, MSAUD, cofounder and executive director, Sweet Water Foundation (Pratt 2020)

The quest for the culture changes needed to advance neuroarts does not end with biology. Creative expression itself generates measurable knowledge, and artistic output is a form of data that tends to be overlooked. A rich vein of belief among artists holds that there are many ways of knowing and multiple strategies for gaining information and insight. If the human response to the arts cannot be reduced to a formula or described solely in physiological terms, it becomes important to honor the power of interpretation, emotion, and storytelling as pathways to health and wellbeing. In the robust, revelatory narrative of a compelling story, arts practices uncover the universal in the particular and broaden the audience that understands the messages of neuroarts.

Certain that the connections made through arts interventions are valid contributors to health, even if they evade standardized scientific measurement, practitioners push back against any suggestion that the arts are in some way

inferior to science. The arts and aesthetic experiences are not simply something “nice to have,” as Western societal norms tend to perceive them, but rather must-haves for wellness.

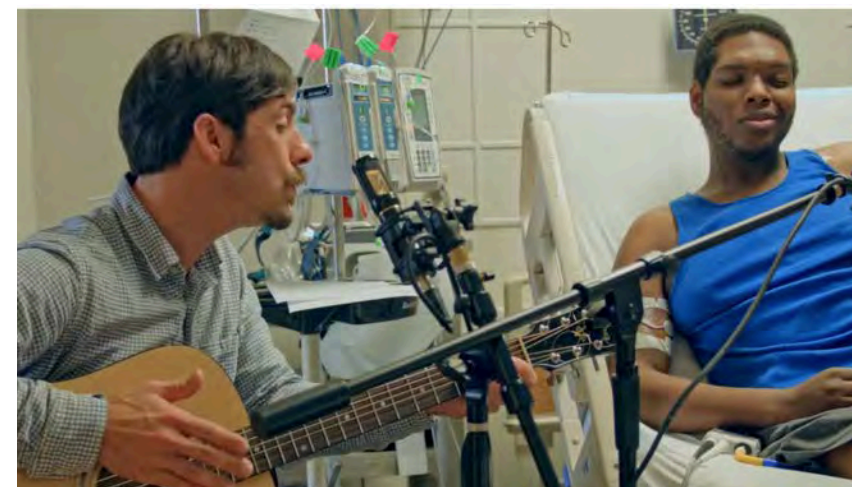
“Can we pay attention to the transformative power of the arts and have neuroscience serve that expression of the human spirit?”

Malika Dutt, JD, MIA, founder and director, Inter-Connected (Dutt 2020)

In its *Guide to Community-Engaged Research in the Arts and Health*, the NEA celebrates the synergistic relationship between science and the arts (Chapline & Johnson 2016). Researchers stand to gain from partnering with those the report calls “arts professionals,” because they “often witness first-hand the effects of their artistic practice on individuals, on groups, and on whole communities. Because they are experts in their fields, arts professionals likely will have insights into what types of arts programs or interventions work best in which settings and for whom. This knowledge can be invaluable in helping to shape research questions, to design research studies, to communicate with the population being studied, and to interpret research results.”

Continuing, the report positions arts professionals as having equally much to gain from researchers who “have extensive training in how to develop research questions, design research studies, and select appropriate outcomes to measure the phenomenon of interest. They also know how to apply the

scientific method in ways that support unbiased design and interpretation of results. . . . Partnering with researchers can help ensure development of studies that maintain high rigor and have the potential for reproducibility” (Chapline & Johnson 2016).



“Because the arts and the sciences are two domains of knowledge that are widely believed to elucidate what makes us human, arts professionals and researchers, in addressing their distinctive audiences, often share a common objective: a desire to identify and maximize the beneficial effects of the arts.”

**NEA Guide to Community-Engaged Research in the Arts and Health
(Chapline & Johnson 2016)**

Nonetheless, the tension between the types of evidence expected in academic research settings and the lived experiences of arts practitioners and the communities they serve is likely to endure to some degree, as perhaps it should. Charles Limb, MD, chief of otology, neurology, and skull base surgery at the University of California–San Francisco and a musician, acknowledges a divide between the goal of scientific objectivity, elusive though it is, and the inherent subjectivity of the arts. But he sees opportunity here as well. “The solution is not to convince people that their way is correct but to figure out how to harness the power of everybody’s approach so that in the end we have a very comprehensive argument for the value of the arts” (Limb 2020).

Convergence is key, suggests Sara Lawrence-Lightfoot, PhD, Emily Hargroves Fisher Research Professor of Education, Harvard University (retired). “That coming together is possible if we reframe the thinking about how much the sectors have in common. At a deep level, the methods of doing good work are not dissimilar in science and in the arts. There is a kind of rigor, a discipline, a discernment, an improvisation, a descriptive, exacting style” (Lawrence-Lightfoot 2020).





The Equity Imperative

Because neuroarts is a new field, its launch provides a rare opportunity to imbue equity in every phase of planning and implementation. This *Blueprint* has been designed with the recognition that an intentional, inclusive approach must be in place from the outset to meet the needs of all whom the ecosystem can serve.

An equity imperative exists at every level—in opportunities to participate in neuroarts-related research and practice activities, in the value assigned to different art modalities, and in the populations that help grow the field and access its benefits. To move forward, neuroarts must include a full constellation of voices—not as players merely invited to the table but as part of the community of leaders *choosing* the table at which they sit, and then *setting* it. Only by seeing themselves as integral to the work can diverse populations participate fully as contributors and beneficiaries.

Despite the artistic traditions that enrich all cultures, communities of color in the United States are invariably underrepresented in professions that house arts practitioners. That disparity exists in architecture (American Institute of Architects 2016), technology (Zippia 2021b), psychology (American Psychological Association 2020), and at least 10 different healthcare professions, including physicians, nurses, occupational and physical therapists, and speech-language pathologists (Salsberg, Richwine, Westergaard, Martinez, et al. 2021).

Discrepancies are also glaring in the fields of science, technology, engineering, and math (STEM), where Blacks and Hispanics hold only 16 percent of the jobs despite representing more than 25 percent of the US workforce. Among those who do hold STEM jobs, 60 percent say they have experienced racial or ethnic discrimination in some form, such as pay disparities, barriers to career success, or workplace slights (Anderson 2018). Women make up only 28 percent of the total STEM workforce, with the largest gaps in some of the fastest-growing and highest-paid professions. They approach parity in the biological sciences (47 percent) but are sparsely represented in architecture and computer-related occupations, both of which have much to offer neuroarts (AAUW n.d.).

To build the pipeline that feeds diversity in neuroarts, training and mentoring initiatives need to begin as early as high school and continue through graduate



education and along career pathways. Support for new and early-career investigators offers a key opportunity to broaden participation. The NIH's Next Generation Researchers Initiative, designed "to promote the growth, stability, and diversity of the biomedical research workforce," is a possible model. That initiative supports meritorious researchers who have not previously received an NIH award, responding to a mandate in the federal 21st Century Cures Act that requires policies designed to "increase opportunities for new researchers to receive funding, enhance training and mentorship programs for researchers, and enhance workforce diversity" (National Institutes of Health Grants & Funding 2019). Were the neuroarts field to adapt that approach, it would be able to reward young investigators, especially from underrepresented populations, who are specifically focused on research that explores the use of the arts and aesthetic experiences to advance health and wellbeing.

Elevating equity also means empowering arts practitioners and those with whom they work to articulate what they need from the neuroarts field, not to be told what the field can do for them. When a diverse swath of stakeholders is included as cocreators and decision-makers, neuroarts can move more fully into the lives of all individuals and communities.

An inclusive approach also signals that no art form is superior to another. Just as we need to acknowledge that the arts sometimes lack the respect accorded to science, so too must we be cautious about assuming that any modality or style is somehow more suited to the task of advancing health and wellbeing

“How do we center the wisdom of people who are not typically understood as experts, but are very proximate to the issues that we care about? How can we bring those perspectives, that wisdom, those voices into conversations about policy, conversations about transformational practice?”

Maria Rosario Jackson, PhD, Institute professor, Arizona State University (Jackson 2020)



than another—that painting is better than digital media, for example, or opera somehow more valuable than hip-hop. Otherwise, we leave room for the kind of inequity that surfaces in private allocations to the arts: nearly 60 percent of private sector arts funding goes to just 2 percent of all institutions, most of them large, with audiences that are predominantly White and upper income (Helicon Collaborative 2017).

Using an equity lens also sharpens the focus on healthier communities, whether measured by clinical outcomes, social cohesion, or economic activity. Social cohesion is the particular emphasis of *WE-Making: How Arts & Culture Unite People to Work toward Community Wellbeing*, a suite of resources that explores the power of place-based arts and cultural practices (National Endowment for the Arts 2021). Another centerpiece publication is *Creating Healthy Communities through Cross-Sector Collaboration*. Funded by ArtPlace America, among others,



and developed by an interdisciplinary group working at the intersection of public health, arts and culture, neurobiology, and community development, this white paper declares, “Health must be woven throughout the fabric of social life, including policy, education, and sociocultural norms.” The authors contend that “arts and culture are critical to this integrating process,” and their call to action identifies five critical public health priorities: collective trauma, racism, social isolation and exclusion, mental health, and chronic disease engagement (Sonke, Golden, Francois, Hand, et al. 2019).

Embedding equity in the design of arts-influenced research and practice requires broad input and intentional strategies to identify and engage agents of change, elevate the value of lived experience, and level the playing field. A climate of mutual respect is central. As Jodie Lesh, chief transformation officer at Kaiser Permanente, noted, “Some of [Kaiser Permanente’s] most successful projects have occurred when we’ve engaged the community to design a building *with us*, ensuring that we consider and address overall wellbeing, including social and environmental factors. The arts provide a unique opportunity to reflect the beautiful diversity of our communities and leverage the remarkable talent of our artists and storytellers” (Lesh 2020).

Given the depth of the culture change involved in structuring equity-focused neuroarts partnerships, stakeholders will likely need training to tackle the tensions inherent in working in new ways and consider the implicit biases that can impede collaboration.



An Opportune Moment

Neuroarts is clearly at an inflection point. Many scientific, practice, and technological factors have aligned, each contributing something critical to the knowing, doing, and scaling that are essential to a strong ecosystem. The new attention to the equity conversation is a further momentum-builder, aligning the assets and strengths of historically excluded populations with the field's development. Preliminary findings about the potential economic benefits of neuroarts (see [Spotlight: Analyzing the Economic Value of Neuroarts](#)) add to the argument that with the right commitments and an integrative approach, neuroarts is ready to blossom.

One example of how bridges are being built to connect scientific breakthroughs, the community of committed arts practitioners, and innovative technology is the partnership between Drexel University and Johns Hopkins University. That research team is studying whether virtual reality can be effectively integrated into creative arts therapy. Their project allows individuals to paint in a 3D virtual space and uses both functional near-infrared spectroscopy and self-assessments to measure impact on reward and mood (International Arts + Mind Lab n.d.).

As science, arts, and technology coalesce, stakeholders representing many disciplines and sectors have new options to share knowledge, foster respectful partnerships, generate broad-based enthusiasm, and sustain and draw on collective intelligence to expand the work.

A further motivator to cultivate neuroarts is the need for fresh ways to address long-standing and seemingly intractable health problems. Challenges piled upon challenges are contributing to unprecedented declines in longevity among Americans (Venkataramani, O'Brien, & Tsai 2021). The past two decades have been scarred by the greatest economic crisis to strike since the Great Depression (Margerison-Zilko, Goldman-Mellor, Falconi, & Downing 2016) and by COVID-19, the first global pandemic in 100 years. A long-overdue reckoning with racism has further underscored the need for new narratives to challenge entrenched norms.

The issues are worldwide. An aging population in high-income countries means that Alzheimer's disease is on the rise, with dementia in some form affecting an estimated 50 million people (World Health Organization 2020b). At the

other end of the life cycle, as many as 20 percent of children and adolescents worldwide experience mental health challenges, many of which go unrecognized and untreated (World Health Organization n.d.). Other global data show that more than 280 million people suffer from depression, some 800,000 die by suicide every year (World Health Organization 2020a), and preventable chronic disease kills 41 million people annually (United Nations 2018).

The cumulative economic burden is enormous. The cost of dementia, according to WHO, was \$818 billion in 2015 (World Health Organization 2020b; World Health Organization 2021a), representing more than 1 percent of the global gross domestic product that year. In the United States, chronic diseases and mental health conditions consume 90 percent of the nation's \$3.8 trillion healthcare budget (National Center for Chronic Disease Prevention and Health Promotion 2021).

In the face of so many intersecting needs, health systems have been unable to provide a full range of vital support. For all its power, clinical medicine alone cannot prevent, treat, or cure all chronic diseases, nor is it equipped to strengthen communities or address the many other threats to wellbeing. What is more, contemporary medicine can be alarmingly impersonal. Volumes have been written about the influence of algorithms, electronic health records, genetic testing protocols, and other potentially dehumanizing components, "with clinical encounters often being hurried, increasingly mediated by technology, and set in impersonal hospital settings" (Harrison 2018).

In this context, the arts enable a more humane framework for meeting health challenges. "One of the ways that the arts come in is to support what may be absent in some areas of medicine," suggested David Leventhal, program director of Dance for PD, part of the Mark Morris Dance Group. He positions the arts as a tool whose holistic model cultivates "humanity, expression, emotional attunement, and community support" (Leventhal 2020).

Urgency, coupled with opportunity, makes a powerful case for a neuroarts ecosystem. Although a widely recognized and broadly influential field will take many years to develop, knowledge will continue to build as we learn more about what works, in which settings, at what dose, and for whom. Based on iterative agreements of what success looks like and how it can be achieved, the field will need to identify measurable short-term wins and long-term milestones to track progress, guided by goals, objectives, and timelines. Now is the time to move systematically, along many parallel tracks, to do all of this, building on the efforts of the many stakeholders who are working tirelessly to bring science and the arts together in service to health and wellbeing.

"Singing is everything to him. Everything.
It has saved his life many times."

Susan Benedetto, Tony Bennett's wife



Analyzing the Economic Value of Neuroarts

Evidence that neuroarts generates meaningful economic benefits could be a game changer for advancing the field. To test that hypothesis, the NeuroArts Blueprint initiative asked KPMG to prepare an independent economic analysis of one strategy: engaging with music to ease symptoms of Alzheimer’s disease (KPMG 2021). In tackling that work, published as *Alzheimer’s Disease and Music Engagement Economic Impact Analysis*, analysts developed a first-of-its-kind model that can be applied to many other art modalities and outcome measures.

KPMG’s initial literature review and expert interviews confirmed the therapeutic promise of music in people with Alzheimer’s, especially to relieve some of its behavioral and psychological symptoms. Further information-gathering, including a review of publicly available population and treatment cost data, informed the analysis and modeling assumptions, which were vetted by experts in neuroscience, psychiatry, behavioral science, music and health science research, and music therapy.

From an economic standpoint, the appeal of music as a complementary treatment is its accessibility and relatively low cost, compared to pharmaceutical therapies. KPMG considered three areas of possible economic impact: increased expenditures associated with the costs of providing music engagement to those with Alzheimer’s disease; reduced expenditures reflecting the need to provide fewer healthcare services to patients who respond positively to music; and reduced burden on unpaid caregivers, who would then be free to take on more paid work and increase their incomes.

Based on its modeling assumptions, KPMG estimated the cost of engaging with music for people with Alzheimer’s disease to be approximately \$816 per year, regardless of disease severity, compared to average annual pharmaceutical costs of \$3,600. The analysis further assumed that engaging with music would reduce the use of pharmaceuticals by 30 percent among patients with mild disease, 16 percent among those with moderate disease, and 8 percent of those with severe disease. That generated an estimated per-patient savings of \$2,150 (mild stage), \$1,665 (moderate stage), and \$1,350 (severe stage).

KPMG then measured total economic impact on the basis of three adoption rates (i.e., the percentage of Alzheimer’s disease patients who had opportunities for music engagement) and assumptions about the percentage who respond positively. Analysts reported taking an intentionally conservative approach to mitigate possible overestimates of benefits and costs. Nonetheless, the bottom line was significant—a potential contribution of \$830 million to GDP.

Using its most conservative adoption rate of 30 percent, KPMG concluded that engaging with music would generate a total economic output of \$996 million, contribute \$830 million to GDP, sustain 7,784 jobs across the US, generate \$369 million in labor income, and produce \$126 million in government tax revenues.

At a 50 percent adoption rate, the contribution to GDP would jump to \$1.4 billion, while at 70 percent, the figure rises to \$1.9 billion.

With this promising start, KPMG offered the following recommendations:

- *Conduct more robust scientific research into the economic impact of music engagement and Alzheimer’s disease.* Given the lack of methodological consistency in existing studies, as reflected in variations in sample size, participant age, disease severity, cognitive level, outcome measures, and nature and length of the intervention, much more needs to be learned. Small samples and evaluations that lack the rigor of randomized controlled trials also limit generalizable findings.
- *Examine the impact of music engagement on quality-of-life indicators among people with Alzheimer’s disease and their caregivers and families.* The KPMG analysis did not use quality-of-life measures, such as physical health, emotional wellbeing, social relationships, sense of belonging, and financial security, which could add important information to the economic impact data.
- *Expand the analysis to health systems worldwide.* Given that Alzheimer’s disease is a health priority around the world, and that arts-based treatments come at a low cost, there is value in conducting comparable analyses in other countries.
- *Expand the analysis to other arts-based interventions and to populations with other health challenges.* The possible economic benefits of engaging with other art modalities, alone or in combination, and extending engagement to other physical and mental health conditions, merits further study. A “true value” analysis that incorporates a full package of economic, social, and environmental impacts would also deepen understanding.



Cultivating the Neuroarts Ecosystem: Principles and Findings

Five core principles and five core findings serve as the evidence-based foundation for cultivating neuroarts as a well-coordinated ecosystem, with its key elements fully integrated and interdependent.

Five Core Principles

Experiencing art is fundamental to being human, a common thread across cultures, racial and ethnic backgrounds, age groups, income levels, and skill sets. The arts offer a shared language, a means of elevating diverse voices, and a catalyst for action.

The arts, as expressed through many modalities, have demonstrable, evidence-based impacts on physiological and psychological health and wellbeing.

Science and technology make possible the ability to understand and measure the biological effects of the arts and aesthetic experiences on individuals and populations.

Neuroarts provides the connective tissue to bring together science, the arts, and technology as equal partners to advance health and wellbeing.

The benefits of the neuroarts field must be readily, consistently, and equitably accessible to all populations across the lifespan and in every community around the world.

Five Core Findings

The arts and aesthetic experiences impact human biology and behavior in ways that differ markedly from any other health intervention. Scientific studies demonstrate that many art modalities act on complex biological systems and mechanisms to generate physiological and psychological effects. As research applies increasingly sophisticated technological tools to learn more, practitioners are already using dynamic and targeted arts interventions to advance health and wellbeing.

Preliminary evidence suggests that the neuroarts field provides economic and social benefits. Metrics to determine the sum of the benefits, rather than just the contributions of individual components, help capture the field's added value across sectors. Empirical research can document the potential for arts practices to reduce healthcare costs (by reducing demand for more costly clinical interventions), promote economic development, strengthen the social fabric, and advance wellbeing. The lived experiences of arts practitioners and the communities they serve are also crucial sources of rigorous evidence for these benefits.

Neuroarts-related activities are everywhere, but they lack a cohesive structure. Although diverse stakeholders are vigorously engaged with some facet of neuroarts, no well-delineated ecosystem brings them together. Neuroarts needs a platform through which robust scientific evidence can emerge from siloes, standards of practice can evolve and scale, and knowledge can disperse in a multidirectional fashion, allowing transdisciplinary and extradisciplinary collaborations to become the norm. This platform must be broadly inclusive, incorporating leaders, influencers, pioneers, and activists across sectors and engaging the communities and individuals who will benefit as full partners.

Neuroarts also requires dedicated funding streams, supportive public sector and private sector policies, and comprehensive framing and messaging strategies. A flourishing ecosystem enables the component parts to collaborate seamlessly while allowing each to retain the autonomy and resources to innovate and grow.

Now is the moment to cultivate the field of neuroarts. Scientists, practitioners, artists, knowledge keepers outside traditional disciplines, and institutions of all stripes are open to new paradigms and enthusiastic about the possibility of driving neuroarts forward. An inclusive set of stakeholders stands ready to accelerate research, showcase practice exemplars, share knowledge and resources, and reach into new communities to strengthen the ecosystem. Public-private partnerships to advance neuroarts are already being developed by the National Endowment for the Arts, the National Institutes of Health, the World Bank, and the World Health Organization, among others. There is also broad interest from arts-related groups and cultural organizations, whether they have a health-related mission or not; from scientific associations, whether they have previously engaged with the arts or not; and from a diverse group of issue- and disease-focused advocacy organizations committed to promoting the health and wellbeing of targeted populations.

Leadership and community-based engagement are essential for neuroarts to progress. The complexity of the health challenges facing society can only be tackled by making space for all points of view. Top-down and bottom-up strategies are both needed to develop neuroarts leaders, champions, and advocates as effective communicators positioned to expand the constituencies committed to the field. At local, regional, national, and global levels, visionary leaders with far-reaching personal and professional networks can play central roles. We also need to nurture leadership capacity among early-career researchers and arts practitioners who see value in embracing the inherently complex nature of transdisciplinary and extradisciplinary work. Within public agencies, private organizations, and academic settings, leadership is key in gaining institutional commitments and engaging diverse stakeholders. Equally important are community leaders and others with grassroots connections and lived experience who have earned the trust of their communities.



Cultivating the Neuroarts Ecosystem: Recommendations and Action Steps

Rooted in these principles and findings, the *NeuroArts Blueprint* offers five core recommendations, each with action steps to guide the multiyear process of developing an ecosystem aligned around common goals:

Strengthen the research foundation of neuroarts.

Honor and support the many arts practices that promote health and wellbeing.

Expand and enrich educational and career pathways.

Advocate for sustainable funding and promote effective policy.

Build capacity, leadership, and communications strategies.

While these recommendations are broadly relevant, specific implementation strategies will likely vary by country, taking into consideration their unique histories, health systems, resources, and priorities. Importantly, some parts of the work outlined here can take place concurrently while other elements will be consecutive, building on prior work. Regardless, establishing a full-blown field of neuroarts is a highly iterative process that demands an intentional and well-articulated strategy to inspire culture change.

Put equity front and center in every recommendation, decision point, and action step designed to advance the neuroarts field.

Every recommendation, decision point, and action step must be implemented with a full-throated commitment to equity. Aggressive outreach, careful listening, site visits, peer review processes, and responsive systems and structures are baseline components for bringing all voices into the dialogue.

Stewardship of the implementation process: This *Blueprint* does not pair each recommendation and action step with a responsible party, recognizing that many combinations of stakeholders and partners will engage as the neuroarts ecosystem evolves. Sometimes, they will work within their own fields, often they will interact across disciplines and sectors, and always they will pursue a collective vision.

While some of their efforts will take place at centers created by academic and other institutions, a centralized resource hub should be established to provide momentum for the dynamic development process. Initially, this hub will be the place to continue the conversations and research that have informed this *Blueprint*; further the community-building that is already underway; centralize data and exemplars, as they are collected; and catalyze further action.

It is not yet possible to lay out a precise, year-by-year strategy for reaching the goals of this *Blueprint*. Rather, we propose three immediate implementation steps to ground the field and bring stakeholders together to select early priorities, sequence the action steps that will enable fluid implementation of the recommendations, and hone a timeline for realizing short-term and long-term goals:

- **Establish a cross-cutting Global NeuroArts Advisory Council to inform implementation and provide oversight and guidance.** Building out from the existing NeuroArts Blueprint Advisory Council, an expanded Global

NeuroArts Advisory Council will be a springboard for boundary-crossing conversations to forge consensus on next steps, identify priorities, foster community, track progress, and support the evolution of the field. Taking a team approach, this advisory council will serve as an umbrella for a set of focused discussions to guide research, practice, education, sustainability, and equity. Establishing in-country or regional advisory groups populated by a diverse selection of community leaders is a further way to nurture on-the-ground insights and identify local opportunities.

- **Develop asset maps to identify stakeholders and sectors that are integral to the neuroarts ecosystem.** An essential prelude to cultivating the neuroarts field is a series of asset maps that define its reach but also draw boundaries so that it is at once broadly inclusive and also clearly focused. Such information is needed to gauge the breadth and depth of the activities already underway and identify the resources that will allow it to go further.

Together, these asset maps should characterize the scientific disciplines, technological fields, start-up investments, art modalities, practice realms, community and patient advocates, educational offerings, and career opportunities that intersect with neuroarts across a broad range of academic, healthcare, government, business, and community settings. A full picture of the public sector and private sector funding and policies already in place within the United States and globally is also needed. Once developed, this information can be used to populate robust databases that allow specific and aggregated searches and help connect stakeholders.

- **Broaden the knowledge base with a commissioned series of white papers.** A set of core learnings can inform institutions and individuals with a role to play in cultivating neuroarts. Topics of these papers should include:
 - **Scaling a field:** Draw on implementation science to consider what it takes to build and scale a field. This paper should examine the emergence of other cross-sectoral initiatives (e.g., environmental science) or avenues of investigation that were once considered fringe thinking (e.g., meditation and mindfulness). Preparing this paper early in the implementation phase will inform the dissemination, adaptation, and scaling at every stage of development.
 - **Elevating equity:** Identify a concrete, comprehensive approach to demographic and experiential diversity, with inclusion-focused strategies built into every component of field development.
 - **Developing a taxonomy:** Review the literature of previous efforts

by neuroarts stakeholders to create consistent search terms and develop a taxonomy that advances shared understanding of the field.

- **Understanding technology:** Analyze the role of technology in current and emerging research and practice interventions and outline the steps necessary for further integration and scaling.
- **Designing clinical trials:** Consider optimal clinical trial designs, including the use of innovative controls, and develop consistent reporting standards to determine the effectiveness of arts-related interventions both for specific diseases and for wellbeing more broadly.

Other papers proposed in the following recommendations explore translational models (research recommendation), outcome measures (practice recommendation), and the framing and language necessary to interest broader audiences in the field (capacity and communications recommendation).



RECOMMENDATION

Strengthen the research foundation of neuroarts.

A synthesis of existing findings is the launch point for determining what we know about neuroarts, identifying gaps, and building on the evidence to learn more. In the absence of structures to pull together the rich evidence base, scientific knowledge about how the brain and body perceive the arts will remain siloed in discipline-specific fields.

Beyond the imperative of collecting, integrating, and sharing existing work, a rigorous quantitative and qualitative agenda will allow new scientific questions to be identified in the realms of basic, translational, clinical, and community-based research. Defining the core elements of arts-based interventions—and developing consistent outcome measures, uniform reporting requirements, and evaluation protocols—will enable comparisons and allow each set of findings to inform others. This approach requires a consensus among stakeholders on terminology, best practices, methodology, outcome measures, and platforms for exchanging knowledge and scaling success.

As the use of arts practices expands beyond specific disease and disorder indicators to harder-to-define concepts of wellbeing and community cohesion, innovative research becomes increasingly important. How do we measure the degree to which the arts allow someone with Alzheimer’s disease to meet a primary health goal of, say, maintaining independence or social connection? What is the impact of an arts initiative on neighborhood violence or recovery from sexual trauma? New design approaches are needed to answer the endless list of such questions.

Importantly, the neuroarts community will need to stretch its thinking about what constitutes rigor, respecting the many ways of knowing that can help determine what works. While no simple formula exists for evaluating interventions that take aim at social determinants of health or perceptions of wellbeing, a number of validated tools merit closer looks. One is the Flourishing Index, structured around six domains—physical and mental health, happiness and life satisfaction, meaning and purpose, character and virtue, close social relationships, and financial and material security (VanderWeele 2017). Another opportunity is Healthy People 2030, which includes metrics to assess the cumulative contributions of health and nonhealth factors to overall wellbeing (Healthy People 2030 n.d.).

Action Steps

- **Establish and promote a premier arts and health research platform for neuroarts, modeled on the vast PubMed search engine.** A comprehensive, artificial intelligence (AI)–driven centralized repository and data management portal is essential to aggregate the scientific evidence at the foundation of neuroarts. A highly interactive platform that is responsive to the needs of the end user will allow researchers and others in the neuroarts ecosystem to conduct intuitive searches and inquiries across a curated and dynamic landscape. It should present data in visually informative ways, organized by discipline, technology, physical and mental health condition, wellbeing measures, art modality, stage of development (pilot, start-up, scaled), study population, institutional setting, and country of origin.

As knowledge continues to accumulate, this platform should allow investigator-initiated research and sponsor-defined projects to be tracked on an ongoing basis. Development of a neuroarts research tutorial will optimize its use, taking full advantage of the data’s depth and breadth.

- **Conduct systematic reviews.** Comprehensive, in-depth analyses of peer-reviewed research and published grey literature, such as reports and white papers, are essential to provide a full understanding of the science of the arts and wellbeing. Drawing on the vast data management portal that will have been assembled and tagged, a series of reviews should identify knowledge gaps, flag redundancy, and inform investigations across myriad and linked criteria. Examples include pairing technologies used with outcomes achieved, studying the intersection of specific art modalities and health status, and identifying constellations of other characteristics that pinpoint interactions of interest.
- **Develop a prioritized research agenda.** By illuminating the knowns and unknowns of how the arts interact on human biological systems, systematic reviews can influence priorities for a basic, translational, clinical, and community-based research agenda that informs practice for diverse populations at the individual and community levels. Informed by priorities already in place at the NIH, NEA, health and culture ministries around the globe, WHO, and elsewhere, this far-reaching agenda should be designed to produce comparable findings that meet agreed-upon standards of rigor. The agenda should be framed by appropriate protocols that define study criteria and endpoints, and are sorted by discipline and time frame.

Early research priorities will likely center on mental health (e.g., PTSD, depression, anxiety, and addiction); aging, including neurocognition and

degeneration (e.g., Alzheimer’s disease and other dementias); early childhood development, including opportunities to bolster biological infrastructure and foster lifelong health; chronic pain and chronic illness; and community wellbeing. Pilot studies in these priority areas will expand proof points and guide further study. Findings from music, the most fully studied modality to date, should inform the agenda, with the Sound Health partnership serving as an important model for codesigning the research strategy.

- **Develop or expand translational models that bridge research and practice.** Translational models apply basic science findings to research settings, with the eventual goal of breaking down silos and bringing new knowledge about neuroarts into practice. Implementation science offers a framework for articulating priorities, developing consensus-driven strategies, agreeing on outcome measures, sharing findings, and supporting dissemination, adaptation, and scaling. A commissioned paper that examines translational models and consensus frameworks in other fields, building on the IAM Lab’s Impact Thinking model, can help pinpoint strategies for bringing people together across disciplines and aligning incentives.

A collegial environment will set the stage for coordination and partnerships. Given the complexity of team science and the many entry points for investigators representing an array of backgrounds and at all stages of their careers, tensions are to some degree inevitable; training and structures up front should encourage transdisciplinary and extradisciplinary collaboration and communication.

- **Conduct a feasibility study for a model Neuroarts Mechanisms Map.** A map that depicts the brain circuitry and neurotransmitter systems engaged through the arts and aesthetic experiences will generate critical information in at least three broad areas: the complex pathways by which different art modalities move through the brain and body, the influence of the arts on physiology, and the effect on behavior. Based on the process through which the NIH launched its breakthrough BRAIN initiative, this feasibility study is intended as the first step in the long-range and highly ambitious undertaking of partnering with the NIH to generate an initial Neuroarts Mechanisms Map.

RECOMMENDATION

Honor and support the many arts practices that promote health and wellbeing.

Creating an environment that elevates the tools, talents, and expertise of arts practitioners begins by acknowledging the centrality of the arts and aesthetic experiences to health, wellbeing, and community cohesion—and recognizing that artists’ roles have not always been fully appreciated or even well understood.

Practitioners must be empowered as full partners with scientists and given opportunities to explore the biological underpinnings of their work, contribute to the growing body of evidence for neuroarts, and share proven practices. Their voice needs to be heard in conversations and convenings that explore taxonomy, articulate priorities for developing and testing interventions, consider the degree to which diverse arts practices can meet on common ground, and identify tools and techniques to adapt and scale interventions that work. When practitioners are embraced as codesigners of strategies, standards, and structures to advance the field, they gain the authority and visibility to inspire interest in their work from scientists, policymakers, third-party payers, and the public and to pursue positive outcomes.

Broad-based input also helps to elevate practices that resonate with diverse populations. To meet the needs and goals identified by the individuals and communities they purport to serve requires intentionality, a commitment to inclusiveness, deep listening, and flexibility.

Action Steps

- **Elevate the importance of arts practices as tools for health and wellbeing.** Arts practitioners will continue to do what they have always done—create, innovate, and apply the health-promoting power of creative expression in clinical and community settings to reach both the makers and users of art. But too often they do so in an environment that does not recognize or reward them adequately. The recommendations throughout this *Blueprint* can advance the field only if they proceed in tandem with narrative changes that lift up the value of the arts and aesthetic experiences as societal

goods and with compensation that rewards it. Framing and messaging research can help to identify the strategies needed to foster such changes.

- **Develop more uniform strategies for collecting and analyzing data so that study findings can be shared.** An iterative set of outcome measures can help articulate a common vision and focus the field. Many disciplines that are part of the neuroarts ecosystem are already trying to consolidate their approaches to outcome measurement so that study findings can be compared more readily. As a baseline for establishing the measures necessary to coalesce the neuroarts field and inform broader alignment, a synthesis paper should be commissioned to explore what is already being done.
- **Evaluate technologies that can be used to amplify and disseminate effective interventions.** While their potential as part of the health and wellbeing toolkit is far from being fully realized, innovative technologies are already informing and enriching arts practices. From data analytics that provide new insights about the power of arts interventions to the therapeutic applications of virtual reality and gaming to the use of telehealth as a means of accessing arts-related practices, technology has an ever-expanding role that should be nurtured.
- **Identify and collaborate with institutional partners who can integrate arts practices into their activities.** Many sectors are well positioned to use and benefit from practices that fit within the neuroarts ecosystem but need intentional strategies for doing so. Individual healthcare facilities and large healthcare systems—from clinics and hospitals to community health centers and group care settings—are principal partners. Greater awareness among physicians and other healthcare providers can also broaden access to integrative healthcare. Beyond the health sector lie many other partnership opportunities, including with community arts organizations, social service and advocacy agencies, and architects, designers, and planners in the built environment and in workplace settings.
- **Scale evidence-based practice.** As evidence accumulates that the arts advance health and wellbeing, successful pilot projects and smaller-scale interventions can be refined, disseminated, and scaled. Strategies are needed to ensure that evidence-based practices across art modalities are shared, adopted, and broadened to reach disparate audiences and inform further work in the field.

RECOMMENDATION

Expand and enrich educational and career pathways.

Well-defined educational and training pathways, course and curriculum development, and strategies for career advancement encourage entry into the neuroarts field and help retain those already working there. The establishment of a new field provides a rare opportunity to prioritize equity in the educational pipeline, with particular attention to ensuring racial and gender diversity.

To build capacity and expand scholarship and its translation, neuroarts should provide exposure from early childhood through secondary school, with well-defined on-ramps that encompass undergraduate coursework and continue through graduate-level degree programs. Universities should make neurobiology central to some of their arts-focused educational activities. Although no single curriculum can ever serve an entire field, a package of synergistic courses and case studies can provide a shared grounding to link disciplines. The ultimate goal is to allow individuals to enter the field of neuroarts from almost anywhere without specific prerequisites—training in medicine or science, a background in social justice or community engagement, or experience in the performing or visual arts would all be appropriate.

In addition to traditional academic routes, new models that embrace multimodal delivery should be considered, including online courses and workshops, grand rounds, internships, and mentoring. Opportunities for collaborations and rewards, including scholarships and prizes targeted specifically at new and early-career investigators, can also widen interest. Deliberate educational boundary busting is called for to encourage cross-cutting collaborations within and across the various scientific and practice disciplines that intersect with neuroarts.

Looking ahead, credentialing or licensing standards are likely to contribute to career pathways, professional growth opportunities, and adequate compensation, all of which are key ingredients of capacity building.

Action Steps

- **Expand the content and availability of academic training at all educational levels.** Opportunities should be created for scientists to learn more about the biological influences of art, for arts practitioners

to understand the scientific underpinnings of what they see on the ground, and for pedagogical approaches that bring them together. Ongoing, in-depth conversations between advocates and educators in the neuroarts field are needed to design and pilot high-quality courses, certificates, and degree programs, as well as to encourage scientific investigations.

Schools of medicine and public health are appropriate settings in which to test cross-cutting training strategies. Can public health and cognitive neuroscience come together through arts practice? How can the science of sensory systems guide arts interventions to address clinical challenges? Pilot initiatives can begin to answer such questions.

- **Build capacity and incentives that draw students into the field and encourage young and early-career professionals to employ neuroarts in their work.** At every educational level and throughout their careers, scientists and arts practitioners, as well as those considering entering the neuroarts field, need opportunities for continuous learning, mentoring, and professional development. Strategic outreach is essential to reach populations who have been historically underrepresented in the sciences, especially communities of color and women.
 - Cultivate interest in how the arts and aesthetic experiences are linked to health and wellbeing, beginning as early as pre-K and continuing throughout the school years. At the high school and undergraduate levels, interdisciplinary courses and informed guidance and career counselors can expose students to the various facets of neuroarts as possible careers.
 - Leverage existing funding mechanisms and training structures to develop career pathways that promote a neuroarts workforce. Predoctoral awards, dissertation grants focused on neuroarts, and career development awards can all be targeted to draw graduate students and early- and mid-career professionals into neuroarts. Training grants and programs can also be modified to support the uptake and dissemination of neuroarts research methods and techniques. In particular, training in innovative methods of scientific inquiry—including patient-centered outcomes research, implementation science, and team science—is uniquely useful to the field.
 - Act with intention to foster a diverse field. Graduate education should include needs-based scholarships and stipends and mentoring programs. Ample opportunities for internships, fellowships, artists-in-

resident placements, and other work experience should also be fully supported so that they are available to trainees from all backgrounds.

- Define and reward career advancement. Promotional tracks within the neuroarts ecosystem should be well characterized, with salary scales and collegial recognition commensurate with other professional fields. The scientific and practice sides should be equitably compensated.
- **Recognize and reward excellence.** Recognition awards can fuel interest among scientists and practitioners at every stage of their careers. Along with providing meaningful financial support, such honors are an incentive to pursue novel research, explore innovative practices, and build partnerships. Possible approaches include a prestigious, best-in-class endowed prize that recognizes exceptional scholarship and a moonshot award to support bold team-based collaborations.
- **Expand community-based training to promote arts practices in nontraditional settings.** Whether promoting neighborhood safety, counseling youth, or helping to reduce substance use, artists, social service providers, community activists, and many others are doing on-the-ground work that can benefit from the tools of neuroarts. Educational on-ramps should be designed to support these professionals in recognizing the power of what they are doing for health and the opportunities to use the arts to support their work.

RECOMMENDATION

Advocate for sustainable funding and promote effective policy.

Dedicated and consistent funding and sound and innovative policies are essential to grow the neuroarts ecosystem. While individual champions can jumpstart engagement, institutional commitments from a network of diverse public sector and private sector partners are ultimately needed.

In the public sector, establishing positive economic and social impact is likely to have particularly strong appeal, whether by documenting systemwide cost savings or measurable effects on individual and community health and wellbeing. Globally, more information is needed about how nations are assigning public dollars—or blending public and private resources—to advance research and practice in the field. In the United States, potential funding pools exist in FY2022 federal budget proposals to increase funding for the NIH, including to accelerate treatments for cancer, diabetes, and Alzheimer’s disease, and for the Centers for Disease Control and Prevention (CDC) to strengthen the public health infrastructure. Likewise, the argument for including neuroarts in the budget lines of local and state departments of public health, education, housing, and parks and recreation is strengthened by establishing relevance to their core missions.

Evidence that engaging in arts activities reduces demand for costly healthcare could encourage insurers to cover arts interventions. Examples include more data and compelling stories demonstrating how the arts reduce the need for pain medication, lessen caretaker burdens, ease the mobility-limiting consequences of chronic diseases, or combine synergistically with other mental health therapies. Value-based payment, where payers hold healthcare systems accountable for improving the health of a defined population and provide rewards when they succeed, is one potential approach. The opportunity to earn more revenue for keeping patients out of clinical settings, rather than for providing more medical services, is a powerful motive for thinking differently about what advances health.

A patient-centered frame can also galvanize support for reimbursement. The National Academies of Sciences, Engineering, and Medicine defines *patient-centered care* as “providing care that is respectful of, and responsive to, individual

patient preferences, needs and values, and ensuring that patient values guide all clinical decisions” (Institute of Medicine 2001).

Other incentives can attract other stakeholders. For example, data demonstrating that the arts boost compliance with drug regimens could be an investment incentive for pharmaceutical companies, while employers may consider supporting neuroarts-related initiatives if integrating arts into the workplace is proven to boost employee health—and thus their bottom line. For their part, philanthropies could be interested in the field if the results support their missions. Social impact investing, crowdsourcing, and other entrepreneurial opportunities are further potential entry points.

Much progress depends on developing persuasive outcome measures. Under the current framework, arts interventions are most likely to interest funders and policymakers if they demonstrate tangible impacts—for example, by reducing hospitalization for diabetes, lowering cholesterol levels, decreasing workplace absences, or increasing productivity. A more expansive vision also considers community cohesion, social determinants of health, cultural and economic accelerators, and wellbeing as health indicators.

As with so much about neuroarts, a broader view of measurement requires a major culture shift. Acknowledging that metrics in clinical settings have traditionally focused on healthcare utilization and cost savings, not on the degree to which patients feel humanely treated or communities become more equitable, Kaiser Permanente’s Jodie Lesh asked a provocative question: “How do we create a more balanced scorecard?” (Lesh 2020).

Action Steps

- **Establish a funding source for pilot studies of arts-related health interventions with scaling potential.** While the bulk of funding for multisite studies must ultimately come from the NIH and comparable government-sponsored granting agencies around the world, a mechanism is needed to pay for earlier studies to gather convincing preliminary data, including estimates of effect size and power analyses. Such empirical evidence is the prerequisite for investigators to compete successfully for funding that supports larger investigations.
- **Build the economic case that investing in evidence-based arts practices can lower the downstream costs of health challenges.** KPMG’s economic analyses of music engagement as a treatment for Alzheimer’s disease (see [Spotlight: Analyzing the Economic Value of Neuroarts](#)) suggests substantial cost savings are possible. Importantly, it also provides a model for further

studies to inform incentives, reimbursement strategies, and policymaking. Initial studies should measure the economic value of arts interventions for targeted diseases and specific populations, followed by the commission of a more ambitious “true value” analysis that assesses the full economic, social, and health value of the arts and aesthetic experiences.

- **Develop an agile fundraising strategy along multiple avenues.** Securing funding is always a multistep process, beginning with establishing a network of early-stage partners prepared not only to contribute resources but also strategic guidance. Long-term commitments and funding streams that are less subject to shifts in organizational leadership or mission are key as well.
 - Assemble a comprehensive database of potential public sector and private sector donors and thought partners in science, health, technology, and the arts, including government agencies, private foundations, corporate funders, and individual and family philanthropies. Along with more traditional funders, this resource bank should include social impact investors, innovation hubs, and start-up enterprises that make decisions through the lenses of impact *and* profit. Developing an asset map of global philanthropy, informed by WHO’s fundraising experience, can help to populate the database.
 - Educate funders about the neuroarts ecosystem. The nascent field is often unfamiliar to funders, and the need for a transdisciplinary and extradisciplinary approach requires a perceptual shift. Collaborative funding networks offer opportunities to bring together funders with focused interests in science, the arts, technology, specific diseases or populations, and equity-building strategies, but such partnerships remain rare. For long-term impact, promote a funding network that welcomes joint proposals from researchers and arts practitioners and encourages philanthropic leaders to share ideas.
- **Deepen knowledge of global funding and policy frameworks.** Many countries have taken neuroarts further than the United States, and we have much to learn about how they have succeeded in securing public sector and private sector policy and funding commitments. While healthcare systems and the degree of support for the arts vary considerably around the globe, a deep dive into who is doing what is a springboard for sharing strategies.
 - Encourage and support an effort by a global partner to synthesize neuroarts-related policies worldwide and propose potential adaptations, with a lens on impact. WHO or an agency within the

United Nations would be an appropriate entity to describe what is already in place. A fully developed asset map goes beyond anecdotal information to offer insights into how policies have been developed and revised, and what works best.

- Identify the locus of opportunity for integrating neuroarts policies into local, regional, and national health and wellbeing activities. In some instances, the right organizational structure might be within a government entity, such as a health, social service, or cultural department or ministry. Elsewhere, community activists, business interests, or educators might also be the initial drivers of change.
- **Identify and pursue strategic public sector and private sector policies to solidify the neuroarts ecosystem.** Individual champions, rather than explicit policies that support, evaluate, systematize, and reimburse the work, have tended to be the push behind neuroarts. Identifying relevant policies, delineated by sector, and advocating for their implementation will help to sustain the field.
 - Incorporate neuroarts into initiatives supported by taxation policy, legislation, or regulation at the federal, state, and local levels. Intentional strategies and funding are needed to advance the science, pilot test and scale innovative practices, and promote their widespread use. Collaborations already underway should be recognized, promoted, and expanded.
 - Build the case for insurance reimbursement. Demonstration projects to foster experimentation should be developed within Medicare and Medicaid (e.g., through the Center for Medicare & Medicaid Innovation and Medicaid waivers) and through private health insurance plans, especially those structured around managed care and value-based payment systems. The community benefit obligations of nonprofit hospitals represent another opportunity to cover the costs of arts interventions.
 - Explore the potential of social prescribing, learning from experiences in the United States and in other countries. Recognizing the limits of healthcare to address many chronic health challenges, social prescribing—in which referrals are made to nonmedical resources to address health and wellbeing challenges—is gaining momentum. The biological basis of the arts and aesthetic experiences offers strong evidence for encouraging clinicians to prescribe or recommend arts interventions as treatment.

- Share and promote workplace policies and models that introduce neuroarts into business, government, and nonprofit settings. Human resource departments, wellness programs, and employee assistance programs are likely to be the most appropriate settings and will benefit from exemplars that show tangible results.

RECOMMENDATION

Build capacity, leadership, and communications strategies.

Stewardship is essential to moving forward on the *Blueprint's* proposed recommendations and action steps. Initially, a solid infrastructure is needed to engage changemakers across sectors, disciplines, and settings. That infrastructure includes the centralized resource hub, previously noted as an early implementation step and described in further detail below, which will serve as a global information clearinghouse and agent of growth.

In time, this center of gravity could evolve into a more formal entity, possibly a professional association. A marker of a mature field, professional associations often play a leadership role through convening activities, a peer-reviewed journal, a resource-rich website, and advocacy. While not a first step in the cultivation process, this appropriate longer-term goal should remain in view as other recommendations in this *Blueprint* are implemented.

Meanwhile, neuroarts activities that crystallize locally will need their own base of operation. This *Blueprint* does not recommend a specific location for such work, recognizing that more than one setting could be suitable, but it does highlight the importance of institutional involvement to create a feedback loop of research and practice that informs the larger field.

Academic settings typically have the necessary structure and resources to help coalesce neuroarts and could be natural homes. Given their unique histories and character, colleges and universities that choose to centralize neuroarts will likely make their own independent choices about a campus or institutional location. A school of medicine could be an appropriate venue, for example, but allied health or public health schools and liberal arts colleges are also suitable, as long as they have strong ties to their institutions' basic science activities.

Rather than a discrete department within a school, another possible approach is to create an institute that draws together faculty from different fields of study. The "centers of excellence model" used by National Cancer Institute-designated Cancer Centers is an example of that structure. While these centers are generally affiliated with university medical centers, several are freestanding entities whose only activity is cancer research. Establishing a limited number of such neuroarts centers in different settings and across regions, with

communications channels developed to tie them together, is a possible strategy.

A wellspring of communications activities should emerge from any foundational structure. Virtually every issue highlighted in this *Blueprint*—from explaining the value of transdisciplinary and extradisciplinary research and evidence-based practices to advocating for educational and career pathways, secure funding, and effective policy—can only be advanced with comprehensive framing, messaging, and communications strategies. Multidirectional case-building, using multiple platforms, will widen the net of stakeholders who see neuroarts as relevant to what they do. Language that is clear and accessible to target audiences is key, allowing science to be explained in a way that moves the field forward. Rigorous data need to be presented, as do compelling stories that capture the vibrancy of neuroarts and the power of carefully implemented and evaluated arts interventions to achieve sought-after outcomes. Recruiting more high-profile messengers, influencers, and local advocates also helps to spread the word and increase the field’s reach.

Action Steps

- **Build out the global resource hub as an agent of convergence.** A center of gravity for the field, the resource hub should guide development of the proposed arts and health research platform, with its vast storehouse of aggregated data; serve as a venue to connect leaders, influencers, and champions; attract new allies; and elevate voices that often go unheard.

As the neuroarts ecosystem continues to grow, this hub should also promote institutional partnerships and communication and dissemination strategies that spread knowledge and support scaling. By tying together networks of stakeholders, the hub should promote cross-cutting exchanges, support the establishment of individual neuroarts programs, and cultivate initiatives designed to foster experimentation and innovation. Many hub resources will be digital, pulling together stakeholders from around the globe, but over time, opportunities for in-person convenings will also be vital.

- **Encourage the establishment of institutional centers to foster rigorous research and training.** Along with enriching the scientific foundation for neuroarts, these local and regional centers will facilitate knowledge sharing, in partnership with practitioners, community and patient advocates, and other stakeholders, and feed findings and experiences into the research platform. While tailored to the needs and culture of their own institutions, they will also generate innovations and data that inform the broader field and contribute to its growth.

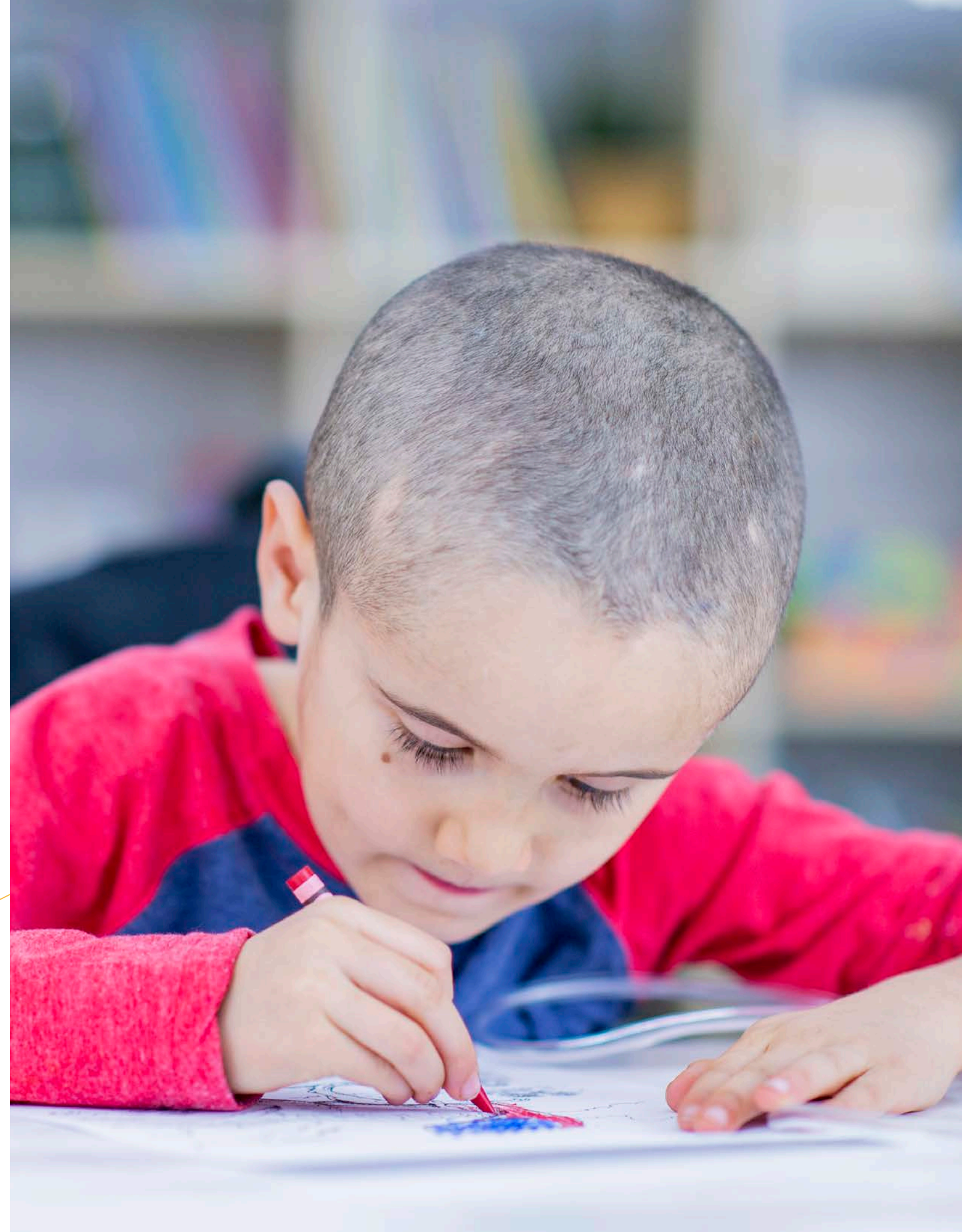
- **Establish and deepen alliances with public and private organizations around the globe.** The asset maps created to paint a comprehensive picture of neuroarts will help to connect the many organizations already involved in some aspects of the field. Recognizing that growth is a shared goal, strategies are needed to foster collaboration, not competition, and to build knowledge, enthusiasm, and participation. A team approach that helps to spread learnings within the United States and globally should be a win-win, allowing organizations to set an agenda consistent both with their own goals and with the neuroarts ecosystem.
- **Develop strategies to build leadership.** At this pivotal moment in its evolution, neuroarts needs many kinds of leaders—early-career investigators and practitioners who think fluently across disciplines, dynamic institutions prepared to take center stage as momentum builds, and champions at every level who can promote the field within their own science, arts, technology, health, and community networks.

As the field coalesces, strategies to cultivate talent should be developed to support and reward the inspired leaders who understand its potential and have the clarity of vision to guide its growth. The incentives described in previous recommendations to promote professional development—among them, awards, mentoring, fellowships, career pathways, and funding—are essential, as are opportunities to collaborate within, across, and beyond traditional disciplines.

- **Conduct social science research to inform the ways in which neuroarts is framed and messaged.** Framing helps to guide the stories we tell, determine what should be emphasized and to whom, and sharpen ideas about the most effective ways to explain a challenge, an idea, or a program. In order to communicate the value of neuroarts to professional and public audiences, the field needs to be properly framed. “The science of framing helps us to be heard and understood,” explains the [FrameWorks Institute](#), a think tank that guides communication about social issues. “When we change the story and how we tell it, we can change the world” (FrameWorks Institute 2021).

A white paper should be commissioned that draws on field and public opinion research to identify gaps, concerns, myths, opportunities, and challenges to inform the frame, which in turn helps to identify messaging tailored to each audience. This framework should include a determination of whether “neuroarts” is indeed the best name for the field and agreement on the definition of other key terms.

- **Develop and implement a comprehensive global communications plan.** Based on the framing strategy, a multipronged and inclusive communications strategy should be executed and continually evaluated. Targeted messages through multiple platforms should draw on data, storytelling, and exemplars to reach multiple stakeholders and bring public attention to the evolving field. A primary communications theme is that neuroarts offers vast opportunities across sectors, disciplines, populations, communities, and disease states to advance health and wellbeing.





Call to Action

Over the long span of recorded history, every culture on Earth has expressed itself through some form of art and benefited from its transformational impact on the brain and the body. Tracing the history of knowledge and thinking about the therapeutic uses of the arts and aesthetic experiences across time and culture is a fascinating exploration, a research project in itself. But cave paintings, Plato's meditations on beauty, Florence Nightingale's insights into the health consequences of sensory experiences, and references to music's place in medical textbooks of the 18th century are well beyond the sweep of this report.

Rather, the *NeuroArts Blueprint* offers a roadmap to the future, recognizing that full implementation of the Recommendations and Action Steps offered here—and the paradigm shift they will enable—is a long-term strategic process. In the first five years, we will measure success by the extent to which we assemble the elements of an interdependent ecosystem so that it is fully operational. The foundational elements of a field that has coalesced include a defined community of stakeholders, an established theory of change, common language, agreed-upon outcome measures, and a sense of shared mission. An effective framing, messaging, and communications strategy should also be in place.

Early champions will be crucial, helping to generate the momentum that allows partnerships to sprout, ideas to crystallize, and structures to be built—and to ensure that equity is at the front and center of decision-making from the outset. The field will also need stewardship in an identifiable home so that resources can be aggregated and action catalyzed; basic, translational, clinical, and community-based researchers can work hand-in-hand with practitioners to grow and apply knowledge; and all stakeholders can have a voice in shaping future directions.

In the years that follow, the increased understanding and use of the arts and aesthetic experiences to drive health and wellbeing will evolve into a mature field. As more transdisciplinary research flows through the pipeline and evidence-based pilot programs are scaled, the synergies between science and practice will inform an ever-more-solid ecosystem. To become sustainable, neuroarts must align the incentives that foster institutional commitments—from governments, across global organizations, among scientific and arts bodies, and in academic, workplace, healthcare, and community settings. Other long-term imperatives include educational and career pathways that produce a diverse,

well-trained workforce; dedicated funding; and public and private policies that accommodate structural change.

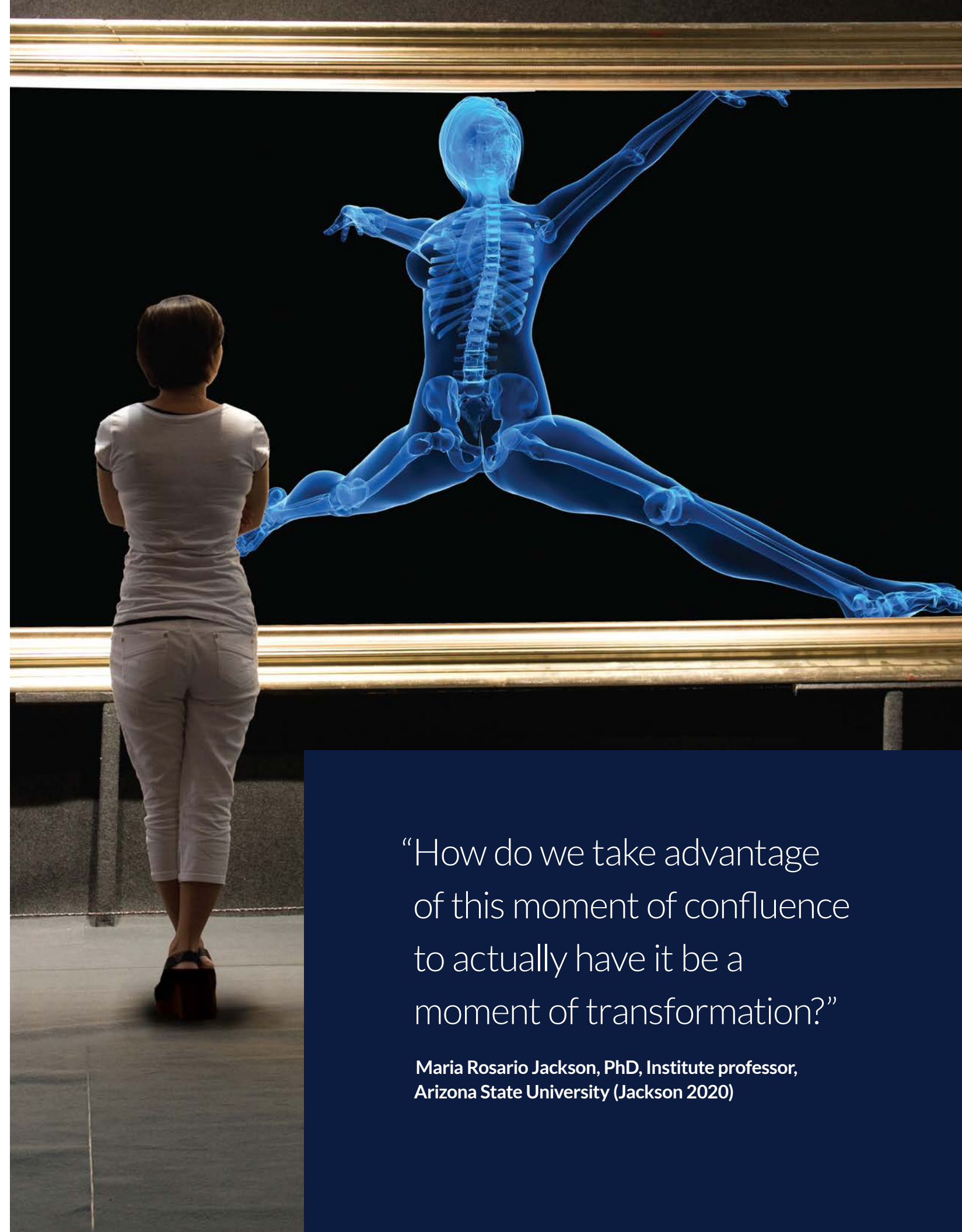
With stakeholders pursuing a collective vision, true success will be the culture change that celebrates the role of arts and aesthetic experiences in building health and wellbeing and the infrastructure that puts it to optimal use.

As we move to solidify neuroarts, it is crucial to underscore, once again, how much energy, creativity, and leadership are already being dedicated to using arts and aesthetic experiences to promote health and wellbeing. Indeed, it is only because such a deep bench of pioneers is showing the way that the need to bring them together across their many disciplines and experiences has become apparent.

The cultivation of neuroarts opens up transformative possibilities at a momentous juncture in history. The societal earthquakes that struck simultaneously in the early 2020s continue to shake up orthodoxies at every turn. Even as a global pandemic, a growing recognition of racial injustice, surging opioid use, and profound health inequities foster a sense of urgency and a receptiveness to new approaches, research and technology are enabling science and the arts to unite as never before to advance health and wellbeing.

“How do we take advantage of this moment of confluence to actually have it be a moment of transformation?” asked Maria Rosario Jackson, PhD, Institute professor at the Herberger Institute for Design and the Arts and Watts College of Public Service and Community Solutions, Arizona State University (Jackson 2020). With its strategy for establishing a well-defined, evidence-based, and inclusive neuroarts ecosystem, the *NeuroArts Blueprint* is helping to answer this critical question.

An extraordinary opportunity is at hand. By fully integrating the arts into health-building activities that are accessible to all, we can foster individual health and wellbeing, strengthen our communities, and fulfill a human birthright.



“How do we take advantage of this moment of confluence to actually have it be a moment of transformation?”

Maria Rosario Jackson, PhD, Institute professor,
Arizona State University (Jackson 2020)

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Pg. 99: Getty images.

Pg. 102: Photo by Kelsey Bennett. Used with permission of Kelsey Bennett.

Pg. 105: Photo by Amber Star Merkens, courtesy of Mark Morris Dance Group/Dance for PD.

Pg. 109: iStock images.

Pg. 114: Used with permission of Project Knitwell.

Pg. 132: Getty images.

Pg. 133: *Poetry*. An embroidery of the sagittal view of the artist's DTI. Artwork by Elizabeth Jameson. Used with permission of Elizabeth Jameson.

Pg. 136: Cover Art, "Creative Minds in Medicine," image by Community Partnership for Arts and Culture courtesy of Assembly for the Arts.

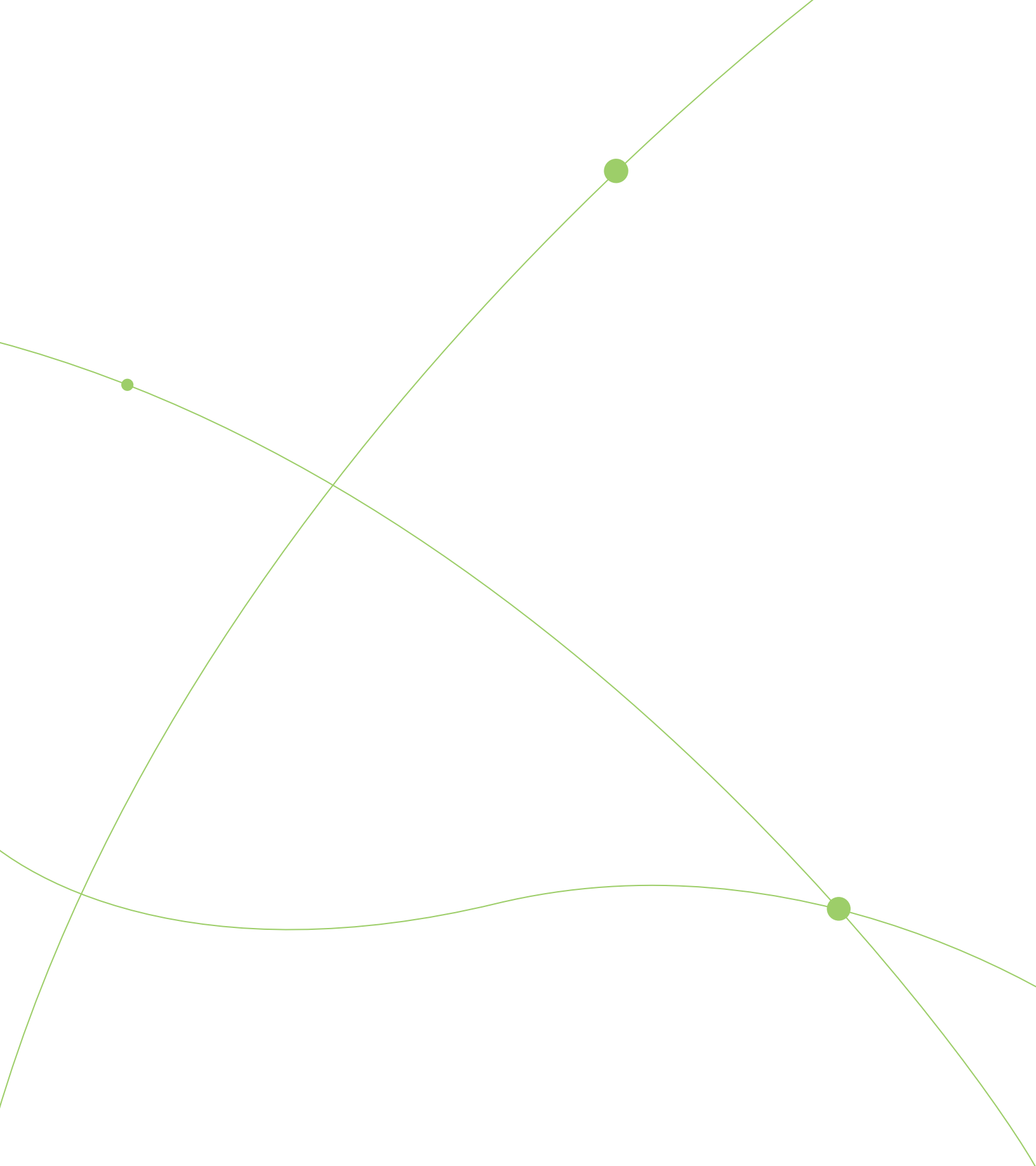
Pg. 149: Getty images.





NeuroArts Blueprint

Advancing the Science of Arts, Health, and Wellbeing



The background is a textured blue gradient. Two thin white curved lines intersect, with two small white circular dots marking the intersection points. The top dot is on the upper curve, and the bottom dot is at the intersection of the two curves.

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