

Appendix

NeuroArts Blueprint

Advancing the Science of
Arts, Health, and Wellbeing

HEALTH, MEDICINE
& SOCIETY PROGRAM
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NEUROAESTHETICS

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Appendix

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Advancing the Science of Arts, Health, and Wellbeing

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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INTRODUCTION TO APPENDIX

This Appendix includes some of the key documents that were commissioned to inform the *NeuroArts Blueprint*:

NeuroArts Today: The State of an Emerging Field is a point-in-time snapshot of neuroarts that documents the nature and degree of the work underway across disciplines and sectors in the United States and around the globe. Based on findings from extensive online database searches, reviews of seminal reports and published analyses, expert interviews, and stakeholder convenings, this report reveals both the broad scope of current scholarship and practice and the fragmented nature of those activities.

Alzheimer’s Disease and Music Engagement Economic Impact Analysis, an analysis undertaken by KPMG, estimates the economic impact of having people with Alzheimer’s disease engage with music. Based on its modeling assumptions, KPMG calculated a potential contribution of \$830 million to GDP in the United States alone. In tackling that work, analysts developed a first-of-its-kind model that can be applied to many other art modalities, diseases, and outcome measures.

Findings from an Online Survey of Stakeholders, conducted by Lake Research Partners, captures insights from more than 300 researchers, healthcare practitioners, artists and cultural influencers, health policy experts, and voices from philanthropy, technology, and business, all representing diverse gender, racial, and age groups. Survey findings suggest stakeholders recognize that neuroarts can transform health and that a collaborative approach has power, but that barriers need to be overcome for the field’s potential to be realized.

Human Capital and the Arts at the World Bank Group, developed by the World Bank, makes the case that health is a fundamental ingredient of human capital and that arts-informed economic interventions are 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.

Neuroarts Today: The State of an Emerging Field

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Key Themes

To consider how best to propel the field of neuroarts forward, it is essential to understand where it stands now. *Neuroarts Today: The State of an Emerging Field* is a point-in-time snapshot that provides that context by documenting the nature and degree of the work under way across many disciplines and sectors in the United States and around the globe.

Neuroarts is the study of how aesthetic experiences and the arts measurably change the brain and body and how this knowledge is translated into practices that advance health and well-being. Affordable, accessible, and immediate, neuroarts promises new opportunities to tackle seemingly intractable societal challenges and nurture the fundamental human capacity to heal and thrive.

Despite the vast and diverse efforts under way in this arena, neither the term “neuroarts” nor the more formal word “neuroaesthetics” have become commonplace. We have chosen to use “neuroarts” here as an important step toward standardizing the field.

The absence of consistent terminology complicates any attempt to provide an overview of the field, but in no way reflects a dearth of interest or lack of productivity. Relevant scholarship has emerged in the disciplines of neuroscience and neurology, education and psychology, medicine and social science, allied health and complementary medicine, pediatrics and gerontology, and elsewhere. Arts-related practices surface in fields as varied as creative arts therapy, arts in health, psychophysiology, affective neuroscience, psychotherapy, rehabilitation science, social work, and community development.

Neuroarts is everywhere—yet nowhere. There is a ferment of activity and vigorous growth in the field, but knowledge, practice, education, policy, and financing are deeply fragmented.

Yet for all the diffusion, there is common cause here—countless academics and clinicians, artists and arts practitioners, community leaders and public policymakers, philanthropists and corporate executives agree on the need to deepen their understanding of the biological mechanism of neuroarts. Regardless of what they call it, they share the goal of applying this knowledge on behalf of human health and well-being.

Neuroarts Today offers a macro-level view of this interdisciplinary field, capturing its evolution in recent years, its current parameters, and its key flex points. Not intended as a systematic or scoping review, it is a status report that includes a mix of data and exemplars to suggest the scale and nature of the many activities that are building knowledge and advancing practice. It is based on findings from extensive

online database searches, reviews of seminal reports and other published analyses, expert interviews, and stakeholder convenings.

The overview presented here captures some of the key themes that have emerged. The bottom line is clear: the intersection of science, technology, and art holds enormous potential to transform health and well-being. But opportunities are being lost because the various strands of the field have not yet been woven into a cohesive whole. By laying out the current status of pathbreaking science, novel technology, innovative practices, and the funding and policy infrastructure, we can begin to design a road map forward.

Research

With evolving technology, the past five years have been an especially ripe time for neuroarts research across many disciplines. Extensive research is available at the molecular level, where perception, neurocognition, the default mode network, and mechanisms of the sensory, stress response, and reward systems are under investigation. Disease-specific work examines mental health issues—such as depression, anxiety, and trauma—and physical health challenges, such as Parkinson’s disease, dementia, mobility limitations, pain, and other chronic symptoms. The relationship of specific arts modalities, such as music, dance, poetry, drama, painting, and crafts, to health is also a rich field of study, as are efforts to understand the role of arts in prevention, quality of life, and community well-being.

The extent of the published research is highlighted by the findings of the [World Health Organization and Health Evidence Network \(HEN\)](#) report (Fancourt & Finn n.d.), which assessed the global academic literature on arts and health in both English and Russian. The synthesis includes 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.

An extensive body of neuroarts scholarship has been published, yet researchers in different disciplines rarely have the opportunity to share knowledge. The result is unnecessary duplication, gaps, and barriers to building on what has already been learned.

Here are some key observations on neuroarts research:

The terminology to describe neuroarts-related research is not standardized and the boundaries of the science have not been established. “Neuroaesthetics,” “empirical aesthetics,” “arts therapy,” and “arts in health” are four commonly used terms, an inconsistency that clouds efforts to assess the scope of relevant work.

The disciplines of education and psychology appear prominently in the published literature, regardless of the neuroarts search term with which they are paired. Searches of “neuroaesthetics” and “empirical aesthetics” in online databases also uncover a heavy emphasis on molecular-level mechanisms (neuroscience and neurology are both prominent disciplines among the results) while searches of “arts therapy” and “arts in health” also return online records in nursing and other practice-oriented areas of translational and clinical research.

Mental health is a major research focus. When terms that reflect various dimensions of the health sector (e.g., “mental health,” “physical health,” “public health,” “disease”) are paired with practice-oriented terminology (e.g., “art therapy” and “arts in health”), “mental health” returns the most online records. “Mental health” is less dominant in the basic science arena represented by neuroaesthetics and empirical aesthetics. When paired with the search term “arts,” “anxiety,” and “depression” produce the most research results (Figure 1).

A search for the association between health and the six most widely studied arts modalities returns more than two million online records. The most significant associations are with music, dance, and poetry (Figure 2).

Music emerges as one of the primary arts modalities under study, whether the search terms are broad or narrow. Whether searching various art modalities and health (e.g., “arts and music,” “arts and dance”), specific health conditions (e.g., “anxiety”), or the broader category of prevention, music typically returns the highest number of online records.

Research targets many subgroups. A search of demographic terms helps to identify the populations most often associated with studies of arts and health. Children emerge by far as the most frequent research target, followed in decreasing order by women, the military, minorities, adolescents, and the elderly (Figure 3). Interestingly, the research emphasis on children isn’t associated with more high-profile practice interventions. By contrast, while there is less research on the elderly population, there is a great deal of practice activity around neurodegeneration and healthy aging.

The heterogeneity in how interventions are designed and outcomes measured complicates analyses of evidence. The lack of consistency in methodological approach and evaluation standards, and the sometimes unreliable quality of the analyses, can cloud the ability to compare research results and build on findings. An example is pain, which is measured in so many different ways that the outcomes of a given intervention are likely to be inconsistent.

“Complementary medicine” is a favored term for research on nontraditional clinical practices. The most common term used to study the links between art and healing approaches that are not generally considered part of mainstream practice is “complementary medicine,” very closely followed

RESEARCH INQUIRIES ASSOCIATED WITH "ARTS"

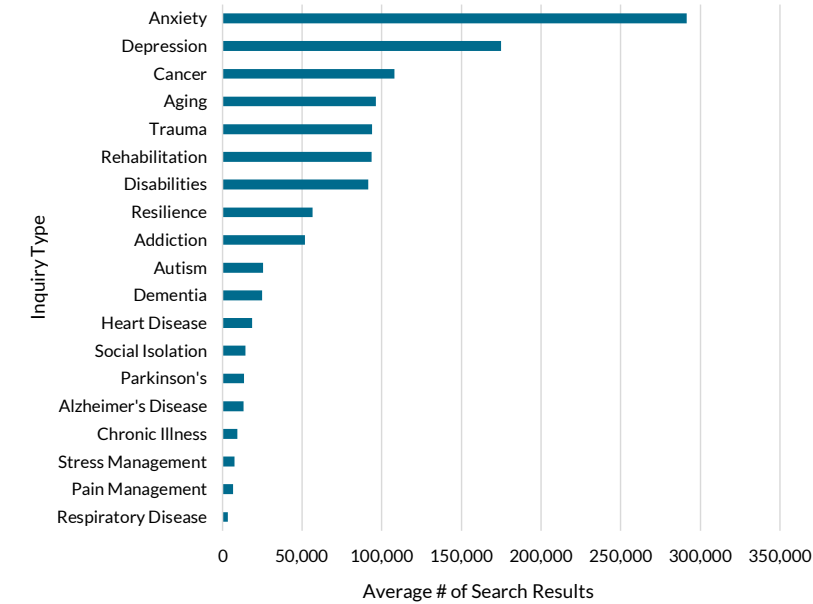


Figure 1 Source: Database searches conducted by the NeuroArts Blueprint initiative staff.

ART MODALITIES MOST ASSOCIATED WITH HEALTH
(BASED ON AVERAGE # OF SEARCH RESULTS)

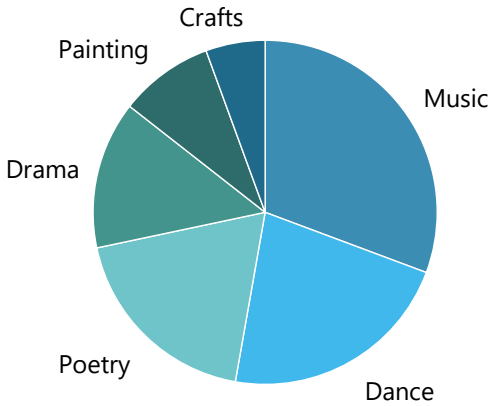


Figure 2 Source: Database searches conducted by the NeuroArts Blueprint initiative staff.

POPULATIONS ASSOCIATED WITH STUDIES OF "ARTS" AND "HEALTH"

(BASED ON AVERAGE # OF SEARCH RESULTS)

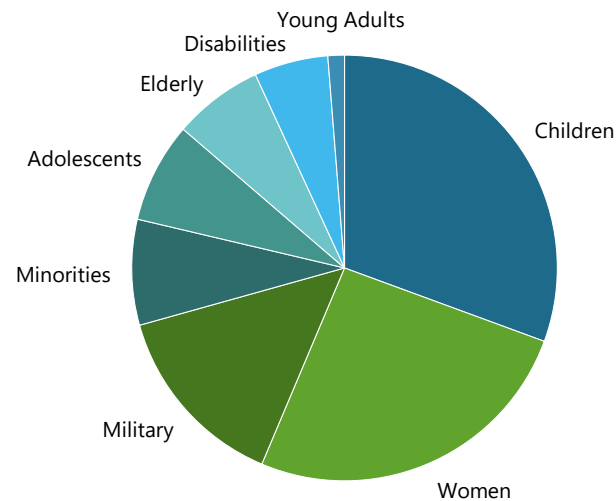


Figure 3 Source: Database searches conducted by the NeuroArts Blueprint initiative staff.

the incentives most valued in an academic setting, such as publications, funding, promotions, and awards. Practical challenges relating to research and publication norms are also barriers to putting arts practitioners on an equal footing with other researchers. Power dynamics further complicate these relationships, as do tensions around whose approach to inquiry can be considered most valid.

Despite the absence of a strong ecosystem to reduce fragmentation, there are many encouraging exemplars of collaboration. Models of cross-sector partnerships are emerging that bring together, in various combinations and in a variety of settings, researchers, clinicians, artists, industry, cultural arts and community organizations, and the public sector. For example, the [Interagency Task Force on the Arts and Human Development](#), convened by the National Endowment for the Arts (NEA), brings together multiple federal agencies to catalyze arts and health research and encourage knowledge sharing. Participants include the US Department of Health and Human Services, the National Institutes of Health (NIH), the National Science Foundation, and the US Department of Education.

Active community involvement is a powerful tool to advance research, but its role in neuroarts research has not yet been fully defined. As one study in [Health Expectations](#) observed, “Community engagement is increasingly recognized as a valuable tool in clinical and translational research; however, the impact of engagement is not fully understood. No standard nomenclature yet exists to clearly define how research changes when community stakeholders are engaged across the research spectrum” (Stallings SC et al. 2019).

Practice

Long before imaging technology and biomarkers were widely available, the use of the arts to generate health and well-being was primarily the provenance of disparate, but dedicated, practitioners. Now that scientists have scans and data to document what happens in the brain and body, new opportunities are emerging for partnerships that can propel innovative programs, interventions, and problem-solving approaches. These are bidirectional relationships, with practitioners eager to use science to inform their interventions and researchers gaining insights from the field to create new knowledge.

The many forms of art practice take place across an array of settings, engage practitioners with different kinds of training and background, and serve a wide range of populations. Whether these interventions are offered in the clinic or the community, they are evaluated with varying degrees of rigor, or none at all, and if the results are published they tend to appear in discipline-specific journals that seldom reach beyond narrowly targeted audiences.

A dominant finding, then, is that neuroarts practices are often fragmented and rarely standardized—

by “allied health.” “Integrative health” and “complementary health” appear much less frequently in the literature.

Findings are not systematically shared across research or practice disciplines. Despite the tremendous vibrancy in the field, opportunities to learn from others and build on what has already been done are getting lost. Professional associations and journals have limited cross-disciplinary reach, and other potential opportunities for sharing are not well developed. The result: a great deal of knowledge but little convergence, both within and across basic science and practice-oriented research.

Researchers and practitioners sometimes seem to operate in parallel universes. Basic scientists may study the mechanisms by which the arts are perceived or executed in the brain, but they often don’t consider the implications for individual health. Arts practitioners may have an intuitive sense of their work’s impact on well-being but no quantitative or mechanistic knowledge of what is actually happening.

The traditional hierarchies in which research operates don’t provide the structures needed for team scientists and arts practitioners. The neuroarts field as it currently stands is not aligned with

formidable barriers to taking full advantage of their potential. At the same time, a ferment of activity and myriad exemplars point to a broad and diverse scope of work that is advancing this evidence-based field.

There is more anecdotal information about how neuroarts is practiced than data documenting the optimal dose and duration of arts as a health intervention. But arts practitioners play a pivotal role in the field, translating new knowledge into on-the-ground treatments and drawing on experience to demonstrate what works.

Here are some key observations on neuroarts practice:

Many kinds of practitioners use art modalities in their work. Practitioners of neuroarts hold degrees and certifications in varied fields, including arts, arts in health, creative arts therapy, social work, counseling, psychology, psychiatry, neurology, physical therapy, recreational therapy, occupational therapy, public health, neuroaesthetics, kinesiology, psychobiology, and rehabilitation sciences. Some use art as their primary therapeutic tool; others draw on it as one among many resources available to them.

Art is used to cultivate health and well-being in many settings. Those include health-care institutions, community centers, recreational facilities, assisted living and nursing home facilities, schools, educational and cultural organizations, and workplaces. The National Coalition of Creative Arts Therapies Associations alone lists 18 different types of settings in which those practitioners work (NCCATA n.d.) (Figure 4).

Exemplary practices are everywhere. While counting the number of programs that put neuroarts into practice is impossible, the breadth of the field is suggested by the many categories into which those activities can be sorted—by setting, populations served, geographic locations, institutional home, disciplines involved, professionals engaged, and participating partners, among others. Grassroots programs percolate up from local communities, top-down initiatives are being developed with national and international support, and along that continuum lie numerous other examples of regional and state-level initiatives.

A dynamic ecosystem of organizations and associations supports neuroarts practice. Some professional associations—such as the National Organization for Arts and Health and the Art Therapy Alliance—are exclusively dedicated to showcasing the links between art and health. Other organizations with much broader health-related missions—such as the American Medical Association and the American Psychological Association—have dedicated divisions or staff particularly interested in the role of arts and health as it relates to their constituents. Similarly, the Academy of Neuroscience

ART CULTIVATES HEALTH AND WELL-BEING IN MANY SETTINGS

Adult day treatment centers	Hospices
Community mental health centers	Neonatal nurseries
Community residences and halfway houses	Nursing homes
Correctional and forensic facilities	Outpatient clinics
Disaster relief centers	Psychiatric units and hospitals
Drug and alcohol programs	Rehabilitative facilities
Early intervention programs	Senior centers
General hospitals	Schools
Home health agencies	Wellness centers

Figure 4 Source: [The National Coalition of Creative Arts Therapies Associations](#).

and Architecture is dedicated to expanding knowledge of how the built environment can be designed to promote physical and mental health. And other partners without a clinical mission—such as the American Alliance of Museums and the National Education Association—increasingly see health and well-being as part of their work.

The siloed nature of practice disciplines diminishes the opportunity for cross-fertilization and shared learning. Many of the journals that cover neuroarts practice are modality- or discipline-specific and attract very different audiences (e.g., *Drama Therapy Review* and *Creative Arts in Education Therapy*). Likewise, many associations with broader missions (e.g., the American Psychological Association and the American Public Health Association) have professional journals that occasionally dedicate special sections to neuroarts-related topics. Without the connective tissue of interdisciplinary conversations and convenings, there are few opportunities to share these resources.

The roles and responsibilities of practitioners across disciplines are not well described. No clear guidelines have been established to link specific forms of practice to specific interventions and settings—that is, we don’t always know when or why creative arts therapy or psychiatry, social work, or occupational therapy might work best. In some circumstances, practice disciplines may be interchangeable as therapeutic pathways while in others discrete training is essential. Without a

consensus understanding of who should be engaged and when, there is a risk that the level of practice expertise may be mismatched to the purpose.

Art practitioners as a group lack racial, ethnic, and gender diversity, echoing a pattern that is also seen in research. For example, as of 2016 almost 88 percent of respondents to a membership survey by the American Art Therapy Association were white, and 93 percent were female.

No consensus exists on how best to measure the evidence that supports practice. Well-defined goals and outcome measures are lacking for many practices, making it difficult to determine their value. In part, this reflects the limits of standard measurement tools and somewhat narrow views of what “counts.” While randomized controlled trials and other quantitative approaches help to translate information to certain audiences, they are not the only way to establish a scientific foundation for neuroarts. Storytelling, narratives, and other qualitative approaches are other “ways of knowing” that can broaden the body of knowledge.

Practitioners are rarely trained in the science of how art influences the brain or body. While they often have direct experience with the ways in which art can promote health and well-being, the underlying neurobiology has rarely been included in their curricula. Many practitioners hunger for that information, seeing it as both a way to strengthen their own practices and as a tool for articulating the power of art with funders and other institutions. But there is a countervailing perspective, with some practitioners resistant to a framework that suggests art only has value when the scientific mechanisms can be delineated.

The scientific world is not structured to appreciate the contribution of arts practitioners to the neuroarts field. Differing training, techniques, and goals create a chasm between research and practice. As more interdisciplinary programs emerge, however, the sharply defined boundaries of traditional academic frameworks may begin to soften.

Practitioners sometimes feel overshadowed by researchers. Practice has been something of a stepchild to science, which generally has more funding and greater prominence. The low pay in professions that use neuroarts in their practices—the annual salary for art therapists averages between \$45,000 and \$65,000—suggests a hierarchy that disadvantages practitioners.

A tension exists between the need for uniformity in practice and the risk of building exclusionary barriers. While stakeholders across disciplines need to speak a common language in order to understand one another, too much standardization has historically limited the conversation and excluded some of those with insights and experience to offer. Where language has not been sufficiently broad, some stakeholders feel that they have had to fight their way into conversations or have never become part of them.

Practitioners often have the trust of a community that researchers lack. Many historically disenfranchised communities have a sense that researchers have long extracted knowledge or resources and then departed to publish their papers without leaving anything of value behind. Practitioners often have deeper ties to communities and different professional motivations, which may put them in a better position to collect data at the same time they provide clinical services.

Financial Resources and Policy

Funding and policies are essential to institutionalize a field—that is, to ensure that neuroarts research and practice are not scattershot efforts by individual scientists, artists, and clinicians but rather reflect well-resourced strategies that can be applied more broadly. For purposes of this overview, we define “policy” as public sector regulations, legislation, and programmatic decisions and private sector actions that advance or deter the evolution of neuroarts.

In the United States, neuroarts research and practice activities tend to be funded piecemeal, with public dollars from local, state, and federal sources and with private funds from philanthropies, health-care institutions, and academic research centers. Insurance mechanisms also cover some of the therapeutic dimensions of neuroarts. Globally, some systematic models of government-driven efforts marry arts and health through policies, partnerships, and funding, although the level of commitment varies.

Significant financial commitments to brain science have made neuroarts ripe for development, but arts-related health research and practice has not become a funding or policy priority in the United States. That work is more robust in other countries.

Some key observations on financial resources and policy are as follows:

Funding for basic science in the United States has been an essential driver of neuroarts. With a 2019 budget of \$424 million, the BRAIN Initiative (Brain Research through Advancing Innovative Neurotechnologies) is a massive public-private effort to accelerate neuroscience research. Other federal investments in basic and translational biomedical and behavioral research and new technologies have added to the storehouse of knowledge that is elevating neuroarts.

The vast basic science investments in the United States that have been so essential to neuroarts have not been accompanied by supportive policies. 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. Funding gaps outside basic science, as well as policy gaps, also reflect the absence of a clearly articulated narrative about the power of art to promote health and well-being and the limited dissemination of persuasive and accessible scientific information.

More attention is paid at the global level to developing a funding and policy landscape for neuroarts. In some countries, a national commitment to population-level health strategies and the differing financial incentives that accompany public systems of health care lift up policies that support neuroarts. The World Health Organization is a leading advocate here, recommending that nations incorporate arts interventions in budget priorities, research, and education.

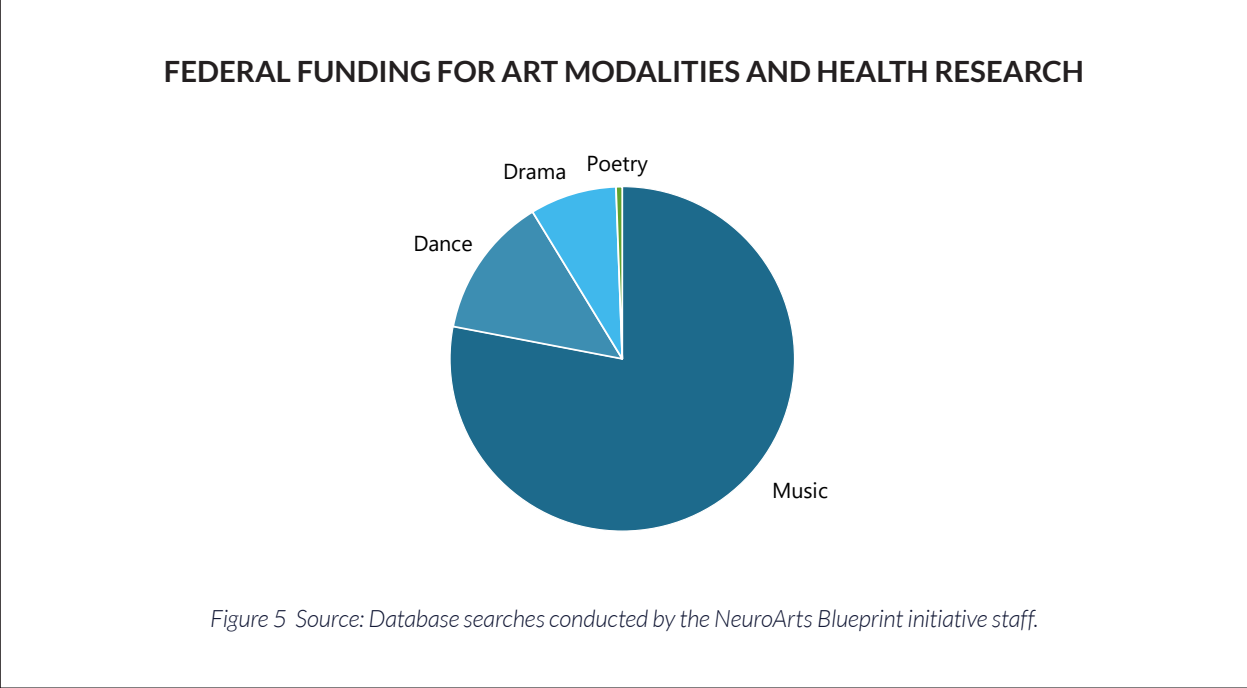
Social prescribing is gaining momentum as a strategy for health-care workers to link patients with arts activities. The United Kingdom and Canada are especially committed to this pioneering approach, which involves referrals to nonmedical resources that help to address health and well-being challenges.

The majority of US public funding for research relevant to arts and health comes from the National Institutes of Health and the National Endowment for the Arts. Augmenting its foundational brain research, music is the dominant modality the NIH has studied, both in terms of dedicated dollar amounts and the number of projects funded (Figure 5). The Sound Health initiative, a partnership between NIH and the John F. Kennedy Center for the Performing Arts, in association with the NEA, is one groundbreaking exemplar, dedicated to expanding knowledge of how music can harness the brain’s intricate circuitry to advance health and wellness and to treat neurological disorders.

The [NEA Research Labs](#) provides grants to interdisciplinary academic teams across the country to support research into a wide range of issues related to arts, health, and neuroscience (National Endowment for the Arts [n.d.a.]). These awards are generally sorted into two broad topic areas: “arts, health, and social/emotional well-being” and the “arts, creativity, cognition and learning.” 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.b]).

Private funding can push forward research and practice. A growing pool of private dollars is being invested in biomedical research labs, providing an increasingly robust alternative to federal funding. Notably, some of these investments are being directed at innovative or high-risk research that may be able to seed later partnerships with public sources.

Payment models for practitioners are inconsistent. Some practitioners, notably creative arts therapists, have been able to secure reimbursement through Medicare, the Affordable Care Act (ACA), or other insurance mechanisms. The ACA’s emphasis on mental health, which is one of the 10 “essential health benefits” that must be covered by certified health plans, also provides a framework



within which to reimburse for arts therapies that are effective in treating conditions such as posttraumatic stress disorder (PTSD). Many other arts practitioners, however, depend on private pay, grants, or philanthropic gifts to their institutions, sources that are tenuous and sometimes irregular.

Systematic public or private sector approaches to using the arts as a component of clinical interventions are limited. While there are many individual neuroarts-related programs and practices within health-care settings, the absence of broad-based institutional commitments or a coherent policy framework keeps them siloed. The National Center for Complementary and Integrative Health, a center within the NIH, is one place that has structural capacity to advance a more cohesive approach.

The trend toward patient-centered care is positioned to be a major driver of neuroarts policy. The Institute of 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” and includes patient-centered care as one of six domains of health-care quality. The ACA’s reimbursement framework, as well as patient preferences, also creates incentives to use art as a tool to humanize health services.

Policies have tended to be crafted on the basis of readily measurable clinical outcomes rather than through the less-precise lens of well-being. The use of crisply defined clinical criteria to evaluate impact and promote scaling reflects existing norms and the reality that they are easier to

measure. But as equity, community inclusion, racial justice, and social determinants of health rise as societal priorities, a more holistic view of what allows people to flourish may shift the approach.

The evidence for the social and economic benefits of neuroarts has not been well explored.

Measures of how art can influence the social determinants of health are poorly developed, and there is no consensus about the potential cost savings involved. Measures of art as a job creator are also lacking. Thinking more broadly about return on investment—not as something that can be measured in a one-to-one equation (i.e., invest x, recoup y), but rather put in the context of broader individual, institutional, and societal goals—may strengthen interest in arts-related policies and resource allocations.

Social isolation, a growing American challenge with significant health consequences, is ripe for policy solutions. The hunger for community and a deeper sense of connection that is palpable in the United States is a potential springboard for policies designed to integrate arts more fully in health-care systems, schools, neighborhoods, workplaces, and elsewhere. Arts are also a tool for building cultural understanding at a divisive time.

Structures and strategies for bringing more attention to the social determinants of health are already in place. Public sector initiatives within the Centers for Disease Control and Prevention and the Medicare and Medicaid Innovation Center, hospital mandates to provide community benefits, philanthropic commitments, and insurance reimbursement structures all provide mechanisms that encourage health-related approaches that go beyond traditional medical care.

The arts as a tool to promote health and well-being have penetrated numerous community settings. As suggested in the practice section, the arts are being used not only to treat specific physical and mental health challenges outside clinic settings, but also to further health literacy, press for equity, foster resilience, and address trauma. For example, Creative Forces, an initiative of the National Endowment for the Arts in partnership with the US Departments of Defense and Veterans Affairs, places creative arts therapists in clinical settings to promote health and wellness for military service members, veterans, and their families. That initiative and many other community-based activities offer baseline insights that can inform broader policies.

The use of art is gaining traction in the workplace. Although there is no central repository of information about art in public sector organizations or private companies, anecdotal information suggests that a number of projects are primed to scale. For example, hospitals have been developing art projects to combat physician burnout, and Walmart has designed a Community Mural Program that is engaging artists in some 1,000 communities to create murals to hang in local stores. Workplace policies are positioned to advance the field.

Conclusion

Whether considering research, practice, funding, or policy, this state-of-the-field overview reveals neuroarts as a highly decentralized enterprise, abundant in informal programs but lacking systems to formalize the work. Inconsistencies in vocabulary and research standards abound, and there is little in the way of shared professional development strategies or avenues for communication among stakeholders. Moreover, the United States lags its global counterparts in making a commitment to neuroarts.

Yet with research increasingly providing rigorous evidence for the benefits of art, powerful synergies are possible. Indeed, they are evident in significant numbers of arts, health, and well-being programs. Institutional commitments and culture change are necessary to give the field of neuroarts a center of gravity that can bring it into wider use and take full advantage of its capacity for transformation.

The institutional conventions of academic science, the norms of clinical medicine, the intuition of artists, and the public’s thirst for health and wellness are often out of sync. Developing and funding formal science-based pathways to foster health and well-being through arts practices would be a transformative step.

References

Fancourt, D., & Finn, S. (n.d.). What is the evidence on the role of the arts in improving health and well-being? A scoping review. World Health Organization Health Evidence Network Synthesis Report 67. Retrieved December 7, 2020, from <https://apps.who.int/iris/bitstream/handle/10665/329834/9789289054553-eng.pdf>

National Endowment for the Arts. (n.d.a). NEA Research Labs. Retrieved December 8, 2020, from <https://www.arts.gov/initiatives/nea-research-labs>.

National Endowment for the Arts. (n.d.b). Research grants in the arts: Program description. Retrieved December 7, 2020, from <https://www.arts.gov/grants/research-awards/research-grants-in-the-arts/program-description>

NCCATA (National Coalition of Creative Arts Therapies Associations, Inc.). (n.d.). About NCCATA. Retrieved December 7, 2020, from <https://www.nccata.org/aboutnccata>

Stallings, S. C., Boyer, A. P., Joosten, Y. A., Novak, L. L., Richmond, A., Vaughn, Y. C., & Wilkins, C. H. (2019, August). A taxonomy of impacts on clinical and translational research from community stakeholder engagement. *Health Expectations: An International Journal of Public Participation in Health Care and Health Policy* 22, no. 4: 731–42. Retrieved from <https://doi.org/10.1111/hex.12937>

Alzheimer's Disease and Music Engagement Economic Impact Analysis



Alzheimer's Disease and Music Engagement Economic Impact Analysis



NEUROARTS BLUEPRINT
INITIATIVE

DECEMBER 2021

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List of Acronyms

AD	Alzheimer’s Disease
ADLs	Activities of Daily Living
BPSD	Behavioral and Psychological Symptoms of Dementia
FDA	Food and Drug Administration
GDP	Gross Domestic Product
I/O	Input-Output
NAICS	North American Industry Classification Systems
QoL	Quality of Life
RCTs	Randomized Controlled Trials

Executive Summary

- **Key Findings:** KPMG’s economic impact analysis found that adopting music engagement for people with Alzheimer’s disease (AD) could significantly benefit the US economy. The potential economic impact increases with the rate at which music engagement is adopted for this population.

Scenario A: With a 30% adoption rate, the participation of people with AD in music engagement could generate **total output of \$996 million**, contribute a **total of \$830 million in Gross Domestic Product (GDP)**, sustain a **total of 7,784 jobs** across the US, generate a **total of \$369 million in labor income**, and generate a **total of \$126 million in government tax revenues**.

Scenario B: With a 50% adoption rate, the participation of people with AD in music engagement could generate **total output of \$1.7 billion**, contribute a **total of \$1.4 billion in GDP**, sustain a **total of 13,509 jobs** across the US, generate a **total of \$615 million in labor income**, and generate a **total of \$210 million in government tax revenues**.

Scenario C: With a 70% adoption rate, the participation of people with AD in music engagement could generate **total output of \$2.3 billion**, contribute a **total of \$1.9 billion in GDP**, sustain a **total of 19,234 jobs** across the US, generate a **total of \$861 million in labor income**, and generate a **total of \$294 million in government tax revenues**.

- **Key Recommendations:** KPMG concluded that further research is needed to understand the efficacy of music engagement as an intervention, the impact of music engagement for people with Alzheimer’s disease on quality of life (QoL), the economic impact of other arts interventions on Alzheimer’s disease, and the economic impact of arts interventions on other health conditions and in other countries.

PROJECT BACKGROUND AND OBJECTIVES

KPMG LLP (KPMG or “We”) was engaged by the Aspen Institute to prepare an independent assessment of the potential economic benefits and costs of using the arts to advance health and wellbeing on the US economy. KPMG’s analysis focused on evaluating the potential **economic impact of engaging individuals with**

Alzheimer’s disease with music in various formats across the US¹ in terms of its contribution to output, GDP, job creation, labor income, and tax revenues. It is important to note that AD is only one form of dementia and was the exclusive focus of this study.

The goal was to inform *The NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing*, a partnership between the Johns Hopkins International Arts + Mind Lab: The Center for Applied Neuroaesthetics (“Johns Hopkins”), and the Aspen Institute’s Health, Medicine and Society Program (NeuroArts Blueprint 2021). As the *Blueprint* states, “With its advocacy of deep systemic changes, this groundbreaking global initiative aims to shake up the status quo and set forth an actionable roadmap to strengthen, formalize, and propel the emerging field of neuroarts” (NeuroArts Blueprint 2021).

For purposes of the NeuroArts Blueprint project, neuroarts is defined 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” (NeuroArts Blueprint 2021).

The NeuroArts Blueprint partners believe that assessing the potential economic benefits and costs of neuroarts on the US economy is a key step in propelling the adoption of art-based interventions to advance health and wellbeing. Alzheimer’s disease and music engagement were chosen for the initial analysis because of the prevalence and severity of the disease, the absence of effective treatments, and the widespread use of music in this population.

Music engagement to improve the health and wellbeing of people with AD could directly impact the US economy in three key ways:

- Increased expenditure on music engagement for people with AD.
- Decreased expenditures on medication and healthcare services resulting from the improvements in the health and wellbeing of people with AD who respond positively to music engagement.
- Increased employee income earned by unpaid caregivers who are able to work more paid hours due to improvements in the health and wellbeing of people with AD.

This report summarizes the analysis undertaken by KPMG and its key findings and recommendations.

ANALYTICAL APPROACH

KPMG conducted a three-phase analysis:

PHASE 1: DATA GATHERING

DEFINING THE ART MODALITY AND POPULATION OF STUDY

¹ For the purposes of KPMG’s analysis, music engagement is defined as any type of music session (e.g., singing, passive music listening, playing a musical instrument, etc.) occurring under an individualized or group setting and undertaken with the intention of improving the health and wellbeing of the individual living with Alzheimer’s disease. Music engagement can be provided by a registered music therapist, but also by any other music professional or provider, or even the individual’s caregiver.

Through a collaborative process based on discussions with Johns Hopkins and the Aspen Institute, as well as a review of primary literature, music was selected as the art modality and people living with Alzheimer’s disease in the US as the population of study. Dementia due to Alzheimer’s disease was chosen as the condition of study because it is a **prevalent disease** of increasing public health concern. Further, **current treatments** for Alzheimer’s disease are **ineffective** and **expensive**. Music engagement was chosen as the intervention of study for two key reasons: first, it is one of the primary art modalities used to enhance health and wellbeing in people with Alzheimer’s disease, and second, a body of scientific evidence indicates that music is an effective treatment for people with AD, with no evidence of a negative effect on any of the primary outcomes studied.

SUMMARY OF LITERATURE REVIEW

Once the scope of study was defined, KPMG performed a targeted and detailed review of publicly available academic literature and information on the effects of music engagement on people with Alzheimer’s disease, including identifying and reviewing relevant peer-reviewed journal articles. The articles reviewed were largely meta-analyses, systematic literature reviews, and some randomized controlled trials (RCTs). The findings indicated that **there is some evidence that music engagement has a positive effect on the health and wellbeing of people living with Alzheimer’s disease**. The most notable primary outcomes studied for which there was a positive effect from music engagement were behavioral and psychological symptoms of dementia (e.g., depression, mood, anxiety, aggression). **None of the articles noted a negative effect of music on any of the primary outcomes** studied. While there is a fair amount of literature on the efficacy of music engagement on dementia, **many of the studies conclude that more robust scientific research in this field is needed**.

ADDITIONAL DATA GATHERING

KPMG conducted further research to gather publicly available population and treatment cost data on Alzheimer’s disease. This step provided a deeper understanding of the **demographics and distribution of the population of study** as well as the **costs of treating the disease**, including the **costs of delivering music engagement**. Data sources included the Centers for Medicare & Medicaid Services (n.d.), the Centers for Disease Control and Prevention (n.d.), the Alzheimer’s Association (2021a), and the American Music Therapy Association (2021). The data gathered in this step was used to build the economic analysis model described in Phase 3.

INTERVIEWS WITH EXPERTS

KPMG conducted confidential interviews with **experts** in the **neuroscience, neurology, psychiatry and behavioral sciences, music and health science research, and music therapy fields**. The interviewees included experts who conduct research on dementia and aging, as well as on music and health; practicing music professionals; and an organization that develops apps and programs for delivering music therapy. These interviews were designed to gain a deeper understanding of the impact of music on people living with Alzheimer’s disease and their caregivers. The experts provided important information and insights on Alzheimer’s disease, the currently available treatments, and experiences with the effectiveness of music engagement. The experts also confirmed KPMG’s understanding that a significant amount of additional rigorous scientific research is required to effectively evaluate the efficacy of music on dementia in all of its forms. Nevertheless, the **general opinion among the experts was that music engagement has a positive effect on the health and wellbeing** and quality of life of people with AD.

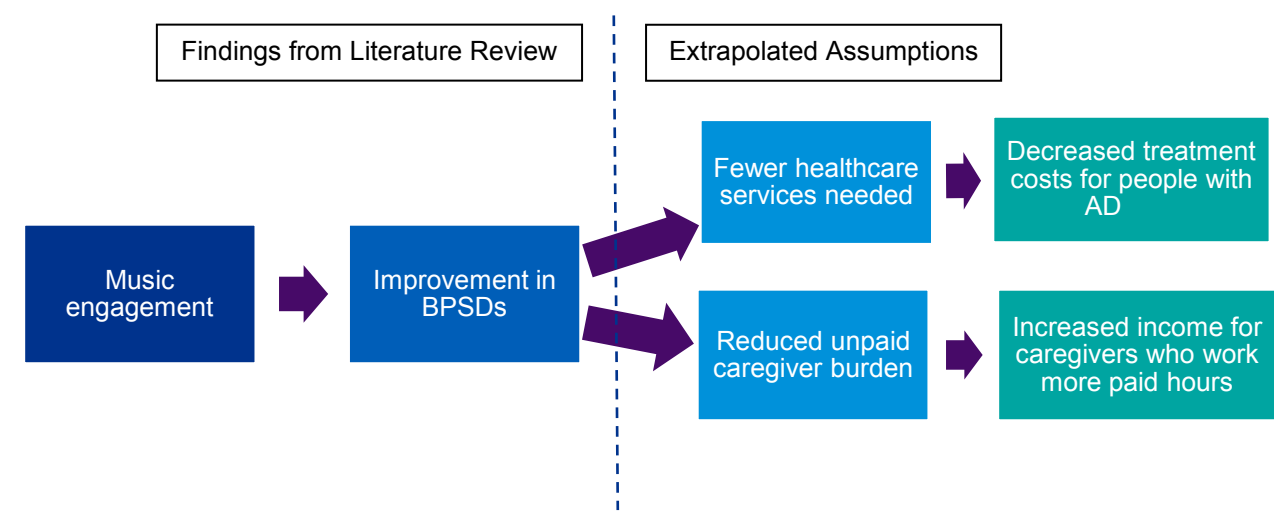
PHASE 2: DEVELOPING THE FRAMEWORK

Based on the detailed literature review and expert interviews in Phase 1, KPMG developed certain key economic assumptions by building on and extrapolating from the documented improvement in behavioral and psychological

symptoms of dementia (BPSDs) among people with AD who respond positively to music engagement. These improvements are anticipated to result in the following:

- A decrease in the need for various healthcare services, such as medication, inpatient hospital stays, outpatient care, skilled nursing facility stays, and home healthcare services, which, in turn, could decrease treatment costs.
- A decrease in the need for care, giving unpaid caregivers more time and capacity to work more hours in a paid job, and earn more income.

The logic flow of these two key assumptions is presented in the diagram below:



The aforementioned experts in the healthcare and music therapy fields reviewed these and other assumptions to ensure that they were reasonable. The majority of the experts either agreed that the set of assumptions were reasonable or concurred that they had no contradicting data or evidence to challenge the assumptions.

Based on these two assumptions we developed seven logical “events” or “shocks” to the economy that were then used to quantify the economic impact of music engagement. These seven events, which either increase or decrease expenditures, and increase labor income, are summarized in the table below.

Increased Expenditure	Decreased Expenditure
Music engagement	BPSD prescription medication
Outpatient care	Inpatient hospital stays
Income of unpaid caregivers	Skilled nursing facility stays
	Home healthcare services

KPMG modeled the cost savings or increases from each of these events and then entered them into the input-output (I/O) model.

PHASE 3: INPUT-OUTPUT MODELING

KPMG employed an I/O model for the analysis. An I/O model divides the economy into a matrix of industries and products/services. It captures all monetary market transactions between industries in a given time period. Using

the I/O model, we estimated the changes to the US economy generated by increasing the use of music engagement among people with AD.

KPMG used IMPLAN (IMPLAN 2020), a US-based regional economic analysis software and data application that is designed to estimate the impact of the results of a shock to the US economy for one or more industries within a specific geographic area (Clouse 2021).

Within the analysis, KPMG analyzed three scenarios where the adoption rate of music engagement among people with AD was 30% (Scenario A), 50% (Scenario B), and 70% (Scenario C). We assumed that not all people with AD who participate would respond positively. By stage of disease, we assumed that approximately 52% of people with mild AD would respond positively, while approximately 28% of people with moderate AD and approximately 14% of those with severe AD would respond positively. We also assumed that it would take five years to ramp up music engagement to achieve a steady state in Year 5; all figures in the economic analysis are for the steady state.

The I/O model measured the following dimensions of economic impact:

- **Direct impacts:** Effects that are directly associated with the use of music to enhance the health and wellbeing of people living with Alzheimer’s disease.
- **Indirect impacts:** Effects that are associated with business-to-business purchases in the supply chain that stem from the input purchases made by the sectors directly impacted by the use of music to advance the health and wellbeing of people living with Alzheimer’s disease.
- **Induced impacts:** Effects that stem from household spending of labor income, after taxes, savings, and in-commuter income.² Induced effects are generated by the spending of employees within the supply chain.

² In-commuter income are types of fringe benefits received by employees that are not taxed as income (see US federal tax code section 132(f)), such as monthly parking or public transit deductions.

SUMMARY OF FINDINGS

The potential economic impact of music engagement is estimated under three scenarios, each using a different rate of adoption among the total population diagnosed with AD.

Potential Economic Impact (2021 dollars)	Scenario A (30%)	Scenario B (50%)	Scenario C (70%)
Output	\$996M	\$1.7B	\$2.3B
GDP	\$830M	\$1.4B	\$1.9B
Employment	7,784 jobs	13,509 jobs	19,234 jobs
Labor Income	\$369M	\$615M	\$861M
Tax Revenues	\$126M	\$210M	\$294M

Scenario A: With a 30% adoption rate, the participation of people with AD in music engagement could generate **total output of \$996 million**, contribute a **total of \$830 million in GDP**, sustain a **total of 7,784 jobs** across the US, generate a **total of \$369 million in labor income**, and generate a **total of \$126 million in government tax revenues**.

Scenario B: With a 50% adoption rate, the participation of people with AD in music engagement could generate **total output of \$1.7 billion**, contribute a **total of \$1.4 billion in GDP**, sustain a **total of 13,509 jobs** across the US, generate a **total of \$615 million in labor income**, and generate a **total of \$210 million in government tax revenues**.

Scenario C: With a 70% adoption rate, the participation of people with AD in music engagement could generate **total output of \$2.3 billion**, contribute a **total of \$1.9 billion in GDP**, sustain a **total of 19,234 jobs** across the US, generate a **total of \$861 million in labor income**, and generate a **total of \$294 million in government tax revenues**.

KPMG further found:

- Based on literature reviewed, music engagement has a positive effect on behavioral and psychological symptoms in a significant percentage of people with Alzheimer’s disease. This conclusion was validated through discussions with experts in a wide variety of fields, including neuroscience, neurology, psychiatry and behavioral sciences, music and health science research, and music therapy.
- Based on data gathered, music is accessible and far less costly compared to pharmacologic treatments for Alzheimer’s disease. Under the KPMG economic model assumptions, the average annual music engagement costs are approximately \$802 (2020 dollars) per person with AD, regardless of disease severity. This is in contrast to average annual per-person prescription costs of approximately \$3,500 (2020 dollars) (Alzheimer ’s Association 2021b).
- Based on these assumptions, the use of music as a health intervention could result in treatment cost savings for people with Alzheimer’s disease who respond positively.

Alzheimer’s Disease Stage of Individuals Who Respond Positively to Music Engagement	Estimated Annual Medical Treatment Cost Savings (2020 dollars)
Mild-Stage AD	\$2,102
Moderate-Stage AD	\$1,636
Severe-Stage AD	\$1,324

Note that the costs in this table were determined by subtracting the reduced total medical treatment costs from the original total medical treatment costs for people with AD who respond positively to music engagement.

RECOMMENDED NEXT STEPS

KPMG recommends the following next steps to further the understanding of the economic impact of music engagement (and other art modalities) as interventions for advancing health and wellbeing for all.

FURTHER SCIENTIFIC RESEARCH ON THE EFFICACY OF MUSIC ENGAGEMENT AS AN INTERVENTION

While there is some literature on the efficacy of music engagement on Alzheimer’s disease, more robust scientific research is needed. Current limitations are primarily due to a lack of consistency in the methodology across studies, such as variances in number of participants, participant age, disease severity, cognitive level, outcome measures, type of intervention (active versus passive), and length of intervention. Further, many of the existing studies have very small sample sizes and are not RCTs. Larger sample sizes increase the likelihood of statistically significant results; RCTs would provide the most reliable evidence of the effectiveness of music interventions because they minimize the risk of confounding factors.

Given the potential benefits of music engagement on people with AD, their caregivers, and the community in terms of improved health, wellbeing, and quality of life, the next step is to pursue further scientific research in this area.

CONDUCT A MORE COMPREHENSIVE ANALYSIS TO EXAMINE IMPACT ON QUALITY OF LIFE

The scientific studies we reviewed provide evidence that quality of life for individuals with AD can be positively impacted by music engagement. Music can also positively impact the QoL of their caregivers and families. QoL encompasses life satisfaction, including physical health, emotional wellbeing, social relationships, quality of environment, work, financial and material wellbeing, personal safety, and a sense of belonging. This economic analysis has not measured those impacts.

Given the potential importance of this measure of health and wellbeing, KPMG recommends that the analysis be expanded to consider QoL benefits of music engagement for people with AD, their families, and other caregivers.

CONDUCT ANALYSES IN OTHER COUNTRIES

The increasing prevalence of Alzheimer’s disease is a global concern; indeed, the World Health Organization has call it a public health priority (World Health Organization 2021). Given this, and the ease and low cost associated with providing art-based treatments, it would be valuable to conduct similar economic (and social) analyses in other countries to assess and potentially establish the arts as a viable and cost-effective intervention for people with AD.

CONDUCT ANALYSES OF THE ECONOMIC IMPACTS OF OTHER ART-BASED INTERVENTIONS ON ALZHEIMER’S DISEASE

Music engagement is one of several art modalities that could be used to enhance the health and wellbeing of people with AD. Other modalities include dance and movement, theatre, visual arts, and more (NeuroArts Blueprint 2021). This analysis could be advanced by performing a multimodal analysis that evaluates economic impacts under a scenario where people with AD engage with more than one type of art intervention.

CONDUCT ANALYSES OF THE ECONOMIC IMPACTS OF MUSIC AND OTHER ART MODALITIES ON OTHER HEALTH CONDITIONS

The model developed for this economic analysis could be applied to evaluate the economic impact of other types of art-based interventions on other populations with a range of mental and physical health conditions. Expanding such work to include QoL analyses would also lead to a more comprehensive understanding of the economic, social, and health impacts of various art modalities on different populations.

It should be noted that the potential contribution of these analyses depends on the availability of quality research measuring the impact of art-based interventions on health and wellbeing—that is, the power of the economic assessments is directly correlated with the strength of the underlying research. As neuroarts research progresses so, too, will the value of economic analyses in furthering the goals of the *NeuroArts Blueprint*.

USE OF A CONSERVATIVE APPROACH FOR THE ECONOMIC ANALYSIS

KPMG’s overall approach to this economic analysis was to be as conservative as reasonably possible to avoid overestimating the economic benefits and costs to the economy. KPMG’s efforts to ensure a conservative approach included

- Developing and using conservative assumptions, with inputs provided from experts in relevant fields.
- Using three scenarios for the rate of music engagement, none of which assumes a 100% participation rate by the population of study, which would likely be unrealistic. Instead, we used 30%, 50%, and 70% participation rates.
- In each scenario, none included a 100% effective rate. As noted earlier, by stage of disease it was assumed that approximately 52% of people with mild AD would respond positively to music engagement, while approximately 28% of people with moderate AD and approximately 14% of people with severe AD would respond positively.

Further, the economic impacts estimated by the I/O model are likely underestimates because it is a partial equilibrium; that is, the I/O model does not adjust for the fact that demand for healthcare services in the US generally outpaces the supply. The results reflect a total reduction in the output, GDP, and labor force of hospitals and skilled nursing facilities (i.e., negative economic impacts) due to the anticipated decrease in demand and spending on various healthcare services by people with AD who respond positively to music engagement. However, given that the demand for healthcare services generally outpaces the supply, it is reasonable to assume that the hospital and nursing facility capacity freed up due to a decrease in use by people with AD would be used for other individuals needing care, rather than resulting in an economic contraction of this sector. The I/O model does not adjust to this new equilibrium.

Project Background and Objectives

BACKGROUND

The NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing is a partnership project of the Johns Hopkins International Arts + Mind Lab: The Center for Applied Neuroaesthetics and the Aspen Institute’s Health, Medicine & Society Program (NeuroArts Blueprint 2021). This global initiative seeks to strengthen, standardize, and propel the emerging field of neuroarts—defined for purposes of the project 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” (NeuroArts Blueprint 2021).

PROJECT GOALS

The Aspen Institute engaged KPMG to prepare an independent assessment of the potential economic benefits and costs of using the arts to advance health and wellbeing on the US economy. KPMG’s analysis focused on evaluating the potential **economic impact of engaging individuals with Alzheimer’s disease with music in various formats across the US**³ in terms of the contribution to output, GDP, job creation, labor income, and tax revenues. The use of music engagement to improve the health and wellbeing of people with AD could directly impact the US economy in three key ways:

- Increased expenditure on music engagement for people with AD.
- Decreased expenditures on medication and healthcare services resulting from the improvements in the health and wellbeing of people with AD who respond positively to music engagement.
- Increased employee income earned by unpaid caregivers who are able to work more paid hours due to improvements in the health and wellbeing of people with AD.

ANALYTICAL APPROACH

³ For the purposes of KPMG’s analysis, music engagement is defined as any type of music session (e.g., singing, passive music listening, playing a musical instrument, etc.) occurring under an individualized or group setting and undertaken with the intention of improving the health and wellbeing of the individual living with Alzheimer’s disease. Music engagement can be provided by a registered music therapist, any other music professional or provider, or even the individual’s caregiver.

KPMG’s analysis consisted of the following key phases:

- **Data gathering:** This phase entailed holding discussions with Johns Hopkins and the Aspen Institute, reviewing preliminary literature to define the art modality and population of study, performing a literature review to gather clinical information on the effects of music engagement on people with AD, gathering demographic and treatment cost data on those individuals, and conducting interviews with experts in neuroscience, psychiatry and behavioral sciences, music and health science research, and music therapy to gather information on the progression of Alzheimer’s disease and the resulting cognitive and behavioral symptoms, the available treatments for the disease, and the impact of music engagement on people living with AD and on their caregivers.
- **Developing the framework:** This phase involved developing key economic assumptions by extrapolating the impact of the improvement in BPSDs on the healthcare services and unpaid care needed by people with AD who respond positively to music engagement. The aforementioned experts in the healthcare and music therapy fields reviewed these assumptions to validate them as reasonable.
- **Input-output modeling:** This phase consisted of employing an input-output model of the US economy to estimate the potential benefits and costs to the US economy of music engagement on people with AD, in terms of output, GDP, job creation, labor income, and tax revenues.

The sections that follow detail the analysis undertaken by KPMG in each phase, as well as the key findings.

Phase 1: Data Gathering

DEFINING THE ART MODALITY AND POPULATION OF STUDY

KPMG and the NeuroArts Blueprint team discussed various art modalities and their application to various health conditions. Through a collaborative process, we initially agreed that music would be the art modality and people living with dementia in the US would be the population of study. KPMG then conducted preliminary research in order to assess whether music for dementia would be an appropriate test case, based on the availability of scientific studies, the prevalence of the disease and its significance to the US economy, and the availability of demographic and treatment cost data.

The targeted population was individuals **age 65 years and older with dementia due to Alzheimer’s disease** because AD is the most common form of dementia, accounting for 60% to 80% of all dementia cases in the US (Alzheimer’s Association 2021b). Further, its prevalence is anticipated to grow as the US population ages. There is also a relatively significant amount of literature on the impact of art on people living with AD. Additionally, publicly available population and cost data on dementia due to Alzheimer’s disease was the most robust compared to other types of dementia.

Music was chosen as the art intervention of choice for two key reasons:

- Music is one of the key art modalities used to enhance the health and wellbeing of people living with AD.
- Some scientific evidence shows that music is an effective treatment for AD, with no evidence of a negative effect on any of the primary outcomes being studied.

For purposes of this study, music engagement encompasses more than music therapy, which is defined as the clinical and evidence-based use of music interventions to accomplish individualized goals through a therapeutic relationship by a credentialed professional who has completed an approved music therapy program (American Music Therapy Association 2021). Rather, we define music engagement here as any type of music session (e.g., singing, listening to music, playing a musical instrument, etc.) occurring in an individual or group setting, with the intention of improving the health and wellbeing of people living with AD. Music engagement can be either active or passive. Active music engagement usually consists of singing, playing instruments, or introducing movements into music (e.g., dance) to improve range of motion, flexibility, and tension. Passive music engagement usually involves listening to certain types of music to improve pain management, improve emotional wellbeing, and help with sleep. Music engagement can be provided by a registered music therapist, another music professional or provider, or a caregiver.

DEMENTIA IN THE US

Dementia is defined as the loss of memory, language, visual perception, problem-solving, and other cognitive abilities that impact functioning and interfere with an individual's activities of daily life (National Institute on Aging n.d.). Dementia is not a specific disease, and the word is used to describe any of several diseases that can cause a decline in mental ability. Alzheimer's disease is the most common cause of dementia.

ALZHEIMER'S DISEASE

In the US, **Alzheimer's disease accounts for an estimated 60% to 80% of dementia cases**.⁴ Compared to other forms of dementia, it is among the slowest to progress, taking up to 20 years before minor symptoms become apparent. The initial, or preclinical, stage has no symptoms. Early signs of Alzheimer's disease can be seen in the mild cognitive impairment (MCI) phase, manifesting as very mild symptoms that do not interfere with everyday activities. As Alzheimer's progresses, individuals commonly experience multiple symptoms that change with time, including noticeable memory loss and thinking or behavioral symptoms that impair the ability to function in daily life. These symptoms reflect the degree of damage to nerve cells in different parts of the brain. Following the mild cognitive impairment phase, Alzheimer's disease has mild, moderate, and severe stages:

- **Mild AD:** In this stage, most people can function independently in many areas, such as driving, working, and socializing, but are likely to require assistance to maintain independence and safety.
- **Moderate AD:** Often the longest stage of the disease, moderate disease is characterized by individuals having difficulties communicating and performing routine tasks, including activities of daily living, such as bathing or dressing, and personality and behavioral changes, including agitation and suspiciousness.
- **Severe AD:** Individuals with severe AD need help with activities of daily living and are likely to require around-the clock care. The impact of Alzheimer's disease on the individual's physical and mental health is most apparent at this stage and the individual is more vulnerable to other health conditions.

The progression of Alzheimer's disease is depicted in the graphic below.



The pace at which symptoms of dementia advance from mild to moderate to severe differs from person to person.

As of 2021, an estimated **6.2 million**⁵ people **age 65 and older** live with AD in the US. AD is officially listed as the sixth-leading population-wide cause of death and is the **fifth-leading cause of death for those over 65**. The long duration of illness before death contributes significantly to the public health impact of AD, amounting to **hundreds of billions of dollars in costs**, because so much of that time is spent in poor health, disability, and dependence. In 2021, Alzheimer's disease and other dementias will cost the US economy an estimated \$355 billion. People

⁴ All facts and data in this section are drawn from Alzheimer's Association (2021b), unless stated otherwise.
⁵ The population of people ages 65 and over living with AD is 6.2 million. Any differences from this figure stated later in this report are due to rounding.

living with AD require assistance with one or more activities of daily living, as well as managing the behavioral and psychological symptoms of the disease. For older adults in the US, 83% of the help provided comes from family members, friends, or other unpaid caregivers, of which 48% is for someone with AD. In 2020, these caregivers provided an estimated **15.3 billion hours of unpaid care valued at nearly \$257 billion**. Caring for a person with Alzheimer's disease or another form of dementia can cause economic, emotional, and physical stress to the unpaid caregiver who often engaged in full-time employment before a family member's diagnosis. As a result of an AD diagnosis, caregivers often reduced their working hours, gave up work entirely, or retired early.

Available Therapies for AD

While there is no cure for AD, there are some treatment options, each with different levels of effectiveness and side effects. For purposes of comparison to music engagement and to facilitate an understanding of relative costs, an overview of available treatments and therapies is as follows:

- **Pharmacologic Therapy for AD:** Pharmacologic treatment options for AD have been extremely limited. Most approved drugs provide symptomatic improvement but do not halt disease progression and often cause significant side effects. The drugs used to treat symptoms of AD can be classified in two main categories (Alzheimer's Association 2021c):
 - **Drugs that treat cognitive symptoms:** These drugs are AD specific and are prescribed to treat symptoms related to memory, thinking, language, judgment, and other cognitive processes. While these medications do not stop or reverse the damage Alzheimer's disease causes to brain cells, they may delay progression for a limited time. The following types of medications have been approved by the US Food and Drug Administration (FDA) to specifically treat cognitive symptoms of Alzheimer's disease: cholinesterase inhibitors, glutamate regulators, and a combination of cholinesterase inhibitors and glutamate regulators.
 - **Drugs that treat behavioral and psychological symptoms of dementia:** AD affects more than just cognitive function, causing a variety of behavioral and psychological symptoms. In the early stages of the disease, these may include irritability, anxiety, and depression. In the later stages, other symptoms include aggression, anger, agitation, emotional distress, physical or verbal outbursts, restlessness, pacing, hallucinations, delusions, sleep issues, and sundowning (increased confusion, anxiety, agitation, pacing, and disorientation beginning at dusk and continuing throughout the night).
- **Currently the FDA has approved one drug, suvorexant, to address insomnia in people living with dementia. Other medications have been prescribed off label to treat these symptoms but have not been approved by the FDA specifically for BPSD. These include psychotropic medications such as antidepressants to treat mood and irritability; anxiolytics to treat anxiety, restlessness, verbally destructive behavior, and resistance; and antipsychotic medications to treat hallucinations, delusions, aggression, agitation, hostility, and uncooperativeness (Alzheimer's Association 2021d).**
- **Recent developments in pharmacologic treatments:** In June 2021, the FDA approved Aducanumab, which is sold under the brand name *Aduhelm*, the first new drug for Alzheimer's disease since 2004. Its approval is controversial due to ambiguous efficacy findings. While clinical trials showed that Aducanumab reduced the level of amyloid plaques in the brain, there was no evidence of an associated reduction in clinical decline (Peripheral and Central Nervous System Drugs Advisory Committee Meeting 2020).

- The side effects of Aducanumab observed during the clinical trials include brain swelling, tiny brain bleeds, headaches, falls, diarrhea, and confusion. The wholesale cost of Aducanumab—which requires an infusion once every four weeks—is about \$4,312 per infusion, or \$56,000/year for a high dose. This exceeds the estimated average annual total costs of caring for a person with AD of approximately \$53,000 (in 2021 dollars), which includes medication (excluding Aducanumab), outpatient care, inpatient hospital stays, and home healthcare services.
- **Nonpharmacologic Therapy for AD:** Nonpharmacologic therapies are designed to maintain or improve cognitive function, overall QoL, or the ability to perform activities of daily living. These therapies may also be used to reduce BPSDs. Examples of nonpharmacologic therapies include computerized memory training, listening to or playing favorite music to stir recall, and using special lighting to lessen sleep disorders. As with pharmacologic therapies, nonpharmacologic therapies do not slow or stop the progression of AD.

Assessing effectiveness is difficult because of the large number of unique therapies tested, the diversity of therapeutic aims, the range of dementia stages presenting, and the lack of a standard method for carrying out any individual therapy.

SUMMARY OF LITERATURE REVIEW

KPMG performed a targeted and detailed review of publicly available academic literature to evaluate the existing scientific evidence on the effects of music engagement on people with Alzheimer’s disease. This phase consisted primarily of identifying and reading peer-reviewed journal articles on the effects of music on individuals living with AD.

The peer-reviewed journal articles reviewed by KPMG consisted largely of meta-analyses, systematic literature reviews, and some randomized controlled trials. The articles were primarily found in publicly available sources, with some made available through the Johns Hopkins University Library. The reviewed articles were published between 2009 and 2021, with studies performed by scientific researchers around the globe. A bibliography of the journal articles and other data sources that were reviewed can be found in Appendix 1.

The purpose of this literature review was to understand the changes in health and wellbeing outcomes of persons living with Alzheimer’s disease that result from music engagement. The outcomes in the various scientific studies we reviewed included

- Cognitive function (Moreno-Morales et al. 2020; Ceccato et al. 2012)
- BPSDs (i.e., depression, agitation, aggressive behavior, anxiety) (Pedersen et al. 2017; Raglio et al. 2015)
- QoL (Cooper et al. 2012; Mittelman & Papayannopoulou 2018)
- Emotional wellbeing (van der Steen et al. 2018; Sakamoto, Ando, & Tsutou 2013)
- Physiological, psychobiological and neuropsychiatric markers (McDermott, Orrell, & Ridder 2014; Sittler et al. 2021)

Most often, the studies were conducted with an experimental group receiving music therapy and a control group continuing to receive standard care. The data were typically analyzed after each intervention to measure any changes in the primary outcome being studied.

There are many variations across the studies. For example, studies evaluated different interventions, such as making music, singing, and other interactive approaches, as well as passive approaches, such as listening to music (Leggieri et al. 2019; Sung et al. 2012; Ridder et al. 2013). The interventions were done in either individual or group settings and lasted for various lengths of time. For example, some studies used twice-weekly sessions of 30 minutes apiece, while others involved once-a-week sessions of 60 minutes. Further, the methodology differed; for example, in some regimens, participants listened on headphones while others streamed music throughout the room. Lastly, there was little consistency in the population under evaluation, with participants varying in ages and stage of dementia.

Based on the aggregate journal findings, we noted that **music** was most frequently cited as having a **positive effect on anxiety, overall behavior, and quality of life**. Music engagement was also very frequently cited as having **positive effects on depression, mood, and emotional wellbeing**. Positive effects of music on cognitive function and agitation were least frequently cited. **None of the articles noted a negative effect of music on any of the primary outcomes** being studied (i.e., music either had a positive or neutral effect). The table below summarizes this review.⁶

Positive Effects of Music Engagement			
Outcomes Measured	Number of Articles That Cited a Positive Effect	Total Articles Reviewed	Positive Effect %
Physiological/psychobiological/neuropsychiatric markers (McDermott et al. 2013)	3	3	100%
QoL and emotional wellbeing (Kishita, Backhouse, & Mioshi 2020)	9	10	90%
Anxiety (Guetin et al. 2009)	9	10	90%
Depression/mood (Vasionyte & Madison 2013)	10	13	77%
Overall behavior, or one of more BPSD outcomes (aggregate) (Lam et al. 2020)	15	20	75%
Cognitive function (Zhang et al. 2016)	6	9	67%
Agitation/aggressive behavior (Vink & Hanser 2018)	5	12	42%

Note that positive effects are not mutually exclusive; a person with AD receiving music engagement may experience positive effects in more than one measured outcome. Given the lack of consistency in methodology across studies, many of the studies we reviewed concluded that **more robust scientific research in this field of study is required** (van der Steen et al. 2017).

ADDITIONAL DATA GATHERING

To conduct the input-output modeling phase, we needed additional data in the economic analysis, including the current costs of treating AD and the nature of the current population of persons living with AD in the US.

We reviewed a variety of information from the following sources:

⁶ The citations in the following table are not exhaustive of all the articles that were reviewed during the literature review.

- Administration for Community Living
- Alzheimer’s Association
- American Music Therapy Association
- Centers for Disease Control and Prevention
- Centers for Medicare and Medicaid Services
- Social Security Administration
- US Bureau of Economic Analysis

Most of the information and data figures related to the population and costs of AD were taken from the Alzheimer’s Association’s *2021 Alzheimer’s Disease Facts and Figures* report, with some conclusions drawn from peer-reviewed journal articles (Koller, Hua, & Bynum 2016). Information on the costs of medication came from the Centers for Medicare and Medicaid Services interactive drug databases (Centers for Medicare & Medicaid Services 2020a; Centers for Medicare & Medicaid Services 2020b).

Information and data figures related to the costs and structure of music engagement sessions were taken from the *American Music Therapy Association 2020 Workforce Analysis* report.

The following table summarizes some of the key statistics (Alzheimer’s Association 2021b).

Population Data	
Total Alzheimer’s Population	As of 2021 , approximately 6.2 million US adults ages 65 and older live with Alzheimer’s disease.
Distribution by Gender	Almost two-thirds of Americans with Alzheimer’s disease are women .
Distribution by Stage of Disease	Of those living with Alzheimer’s disease, 28% are in the mild stage (1.8 million), 31% are in the moderate stage (1.9 million), and 41% are in the severe stage (2.6 million). ⁷
Average Life Expectancy and Mortality Rate	People 65 and older survive an average of 4 to 8 years after a diagnosis of Alzheimer’s disease. The average mortality rate of a person living with Alzheimer’s disease is 6.5% (Statista 2021).
Duration of Each Disease Stage	Based on the assumption of 8 years of life expectancy starting from the mild stage and on the Reisberg Scale (Dementia Care Central 2020). ⁸ The time spent in each disease stage is as follows: mild, approximately 2 years; moderate, approximately 4 years; and severe, approximately 2 years.
Treatment Costs (Alzheimer’s Association 2021b)	
Total Cost	In 2021 , Alzheimer’s disease and other dementias cost the US economy \$355 billion , including \$239 billion in combined Medicare and Medicaid payments.

⁷ Note that the sum of these numbers add up to 6.3 million instead of 6.2 million due to differences from rounding. The population of people with AD in the US should be 6.2 million.

⁸ The Reisberg Scale—also known as the Global Deterioration Scale for Assessment of Primary Degenerative Dementia—is the most commonly used scale for rating dementia by the stage of the disease. The Reisberg Scale has a total of seven stages, from Stage 1: No Cognitive Decline to Stage 7: Very Severe Cognitive Decline (late dementia). See Dementia Care Central (2020).

Average Care Costs by Disease Stage	In 2020 dollars, the average total AD care costs per person are estimated to be \$50,742 . Average annual costs are \$34,158 in the mild stage , \$43,381 in the moderate stage , and \$67,674 in the severe stage .
Music Engagement Costs (American Music Therapy Association 2020)	
Average Cost of an Individual Music Session	The average cost of an individual music session in the US in 2020 was \$76.22 per hour .
Average Cost of a Group Music Session	The average cost of a group music session in the US in 2020 was \$85.38 per hour .

INTERVIEWS WITH EXPERTS

To gain additional insights, KPMG conducted individual, confidential interviews with experts in the fields of neuroscience, neurology, psychiatry and behavioral sciences, music and health science research, and music therapy. The interviewees included practicing geriatric physicians, clinical researchers who actively conduct research on dementia and aging, as well as on music and health, practicing music professionals, and an organization that develops apps and programs for delivering music therapy. The interviews generally lasted one hour and were conducted virtually.

The primary objective of conducting these interviews was to gather more information on dementia, AD, and the efficacy of music engagement on people living with dementia. KPMG also wanted to gain a better understanding of the common causes of dementia, the progression of the disease, and the standard treatment protocols. We also wanted to understand the existing evidence on the efficacy of music engagement on people with AD, as well as whether the efficacy of music engagement varies by how it is delivered, the environment in which it is delivered, the age of onset, or the stage of disease.

Based on these discussions, KPMG confirmed its understanding that the most common cause of dementia is Alzheimer’s disease. The **widespread opinion** was that there is a **positive effect of music engagement on the health and wellbeing on people with Alzheimer’s disease**, as it relates to the improvement of behavioral and psychological signs of dementia and quality of life. Many of the experts pointed out that the evidence of a positive impact on cognitive function is not as strong as it is on BPSD outcomes. As with the literature review, there was a consensus that no form of music engagement would make a person with AD worse (i.e., the effect is either positive or neutral). Several of the experts noted that the current Alzheimer’s drugs were limited in efficacy and only delay disease onset or progression for one to two years, with notable side effects. Experts working in music therapy fields emphasized that it is important to engage individuals in their preferred music of choice and that no prior music experience is required to reap the full benefits of music engagement.

The experts interviewed concurred with the literature review finding that further scientific research needs to be conducted to definitely determine the benefits of music engagement on AD. For the economic analysis, KPMG created a logic framework of assumptions, anchored in the primary conclusion that there is some scientific evidence of music engagement’s positive effect on people with AD. These assumptions were vetted with these experts to ensure that they were reasonable and are discussed in further detail in the next section.

Phase 2: Developing the Framework

ASSUMPTIONS

In the context of this economic analysis, an assumption is defined as an initial condition that is used to isolate the effects of a change in one variable on the outcome being measured. Assumptions are accepted as true, or at least plausible, and are crucial in determining and measuring the outcome of the economic analysis.

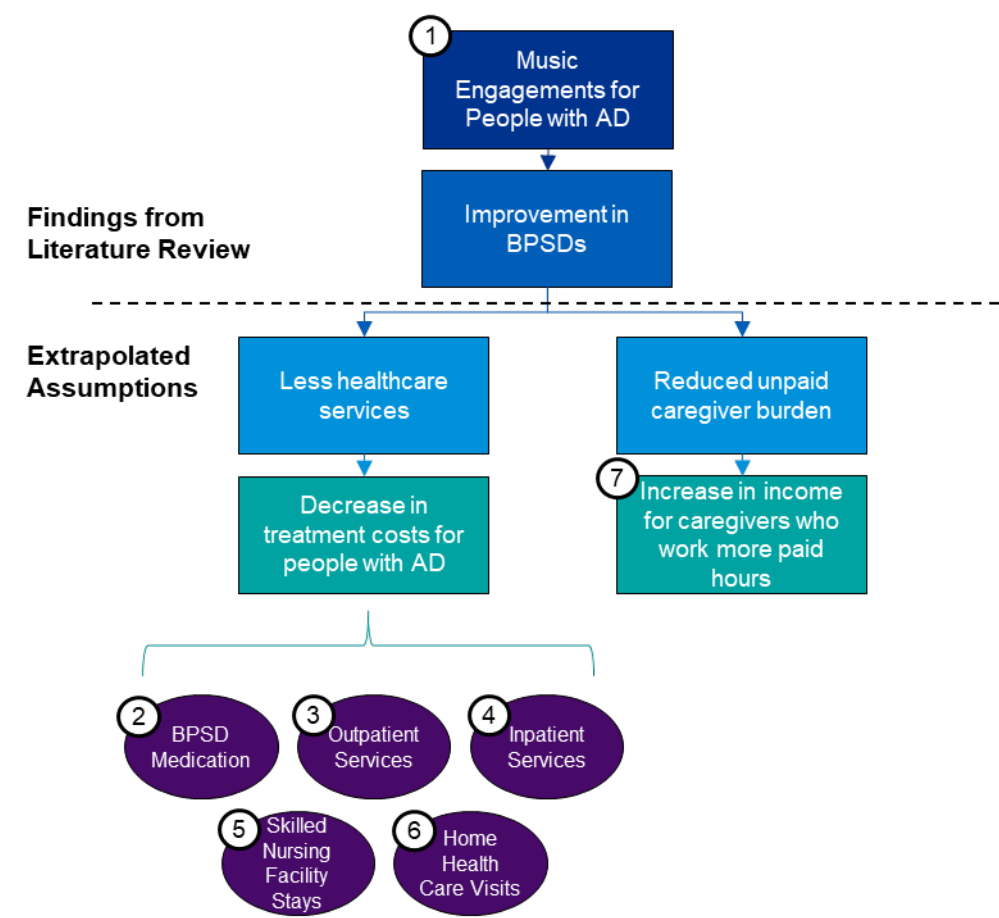
The key assumptions for this analysis are anchored in the conclusion from the literature review and expert interviews in Phase 1—that a body of scientific evidence demonstrates that music engagement has a positive effect on BPSDs in a significant percentage of people with AD. Specifically, KPMG developed certain key economic assumptions by building on and extrapolating from the documented impact of the improvement in BPSDs on the healthcare services and unpaid care needed by people with AD who respond positively to music engagement.

The documented improvement in BPSDs resulting from music engagement is anticipated to result in the following:

- A decrease in the need for various healthcare services such as medication, inpatient hospital stays, outpatient care, skilled nursing facility stays, and home healthcare services, which could in turn decrease treatment costs.
- A need to provide less care to people with AD, giving unpaid caregivers more time and capacity to work more hours in a paid job, and therefore the ability to earn more income.

These and other assumptions were reviewed by a group of experts in the neuroscience, neurology, psychiatry and behavioral sciences, music and health science research, and music therapy fields to obtain their feedback. The majority of experts either agreed that these assumptions were rational or concurred that they had no contradicting data or evidence to challenge them.

The following diagram illustrates the flow of logic used to develop the assumptions and outlines the seven economic events or shocks. The first event is the increased use of music engagement.



DECREASE IN TREATMENT COSTS FOR PEOPLE WITH ALZHEIMER'S DISEASE

Within each set of assumptions about reduced treatment costs, there are nuances in the response to music engagement. KPMG assumes that a positive response exists at any stage of AD but the response differs across stages and rates of cognitive decline. In general, people with mild-stage AD are anticipated to exhibit the largest overall decrease in the level of treatment and care required, while in the severe stage, they are anticipated to exhibit the smallest overall decrease; people in the moderate stage of AD fall somewhere in between.

KPMG assumed there would be an improvement in BPSDs among every person with AD who responds positively to music engagement. As with existing therapies, music engagement treats only AD symptoms, not their causes. As such we assumed that if music engagement effectively treats symptoms, the need for other treatments and therapies would be reduced. KPMG extended this rationale to assume that the use of music engagement would lead to the following impacts and associated costs:

- **BPSD prescription medication:** KPMG assumed that people with AD who responded positively to music engagement would require less medication to treat their BPSDs, either through smaller or less frequent doses. BPSD medication usage would be reduced more in the mild stage of AD compared to the moderate stage, which in turn would be reduced more than in the severe stage.

- **Outpatient care:** KPMG assumed that people with mild AD who responded positively to music engagement would achieve a level of health, wellbeing, and independence such that they would require significantly fewer inpatient hospital stays and more outpatient care (defined as a medical procedure or test that can be done without an overnight hospital stay, such as a consultation, lab services, physician’s visit, or emergency room visit). KPMG also assumed that given their levels of cognitive decline, people with moderate and severe AD would not achieve the same level of independence as people with mild AD and their level of inpatient hospital stays would not decline significantly. However, KPMG assumed that people with moderate and severe AD who responded positively to music engagement would require slightly less outpatient care, such as emergency room visits linked to falls or mental health crises.
- **Inpatient hospital stays:** KPMG assumed that people with AD who responded positively to music engagement would require fewer inpatient hospital stays (defined as a hospital admission for an overnight stay of any period of time). People with mild AD would require significantly fewer inpatient hospital stays compared to people with moderate AD, who in turn would require fewer inpatient hospital stays compared to people with severe AD.
- **Skilled nursing facility stays:** KPMG assumed that people with AD who responded positively to music engagement would require fewer skilled nursing facility stays (defined as inpatient nursing and therapy care in a rehabilitation or treatment center).⁹ Again, the drop in usage would be most significant in the mild stage, less so in the moderate stage, and even less in the severe stage.
- **Home healthcare services:** KPMG assumed that people with AD who responded positively to music engagement would require fewer home healthcare visits (defined as supportive care provided by a professional caregiver in the individual’s home).¹⁰ People with mild AD would require significantly fewer home healthcare visits compared to people with moderate AD, who in turn would require fewer home healthcare visits compared to people with severe AD.

REDUCED UNPAID CAREGIVER BURDEN

Increase in income for caregivers able to work more paid hours. KPMG assumed that people with AD who responded positively to music engagement would require less immediate care from their unpaid caregivers. Accordingly, KPMG assumed that these caregivers would have a modest amount of newfound time, some of which they would devote either to working additional hours for their current employers (for which they receive payment) or reentering the labor force and being paid. KPMG assumed that more such hours would be made available for caregivers of people with mild AD compared to caregivers of people with moderate AD. Similarly, KPMG assumed that more such hours would be made available for caregivers of people with moderate AD compared to severe AD.

The key assumptions resulting from changes in treatment costs and reduced unpaid caregiver burden in the economic model are summarized in the tables below.

POPULATION ASSUMPTIONS	
Assumption	Description
Total Alzheimer’s Population	As of 2021, approximately 6.2 million US adults ages 65 and older live with Alzheimer’s disease (Alzheimer’s Association 2021b).

⁹ Skilled nursing facilities provide direct medical care that is performed or supervised by registered nurses.
¹⁰ Home healthcare visits include part-time skilled nursing care, home health aide (personal hands-on) therapies, and medical social services in the home.

Distribution by Disease Stage	Of those living with Alzheimer’s disease, 28% are in the mild stage (1.8 million), 31% are in the moderate stage (1.9 million), and 41% are in the severe stage (2.6 million). ¹¹
Average Life Expectancy and Mortality Rate	For the analysis, it was assumed that the average life span from the beginning of the mild stage to the end of the severe stage is approximately 8 years . The average mortality rate of a person living with AD is 6.5% —meaning that, on average, 6.5% of the population with AD over age 65 die each year. ¹²
Duration in Each Stage of Disease	Based on the assumption of 8 years of life expectancy starting from the mild stage and on the Reisberg Scale (Dementia Care Central (2020)), the time spent in each disease stage was assumed as follows: mild for approximately 2 years , moderate for approximately 4 years , and severe for approximately 2 years .
Percentage of the Population on Medication	Studies have indicated that approximately 32% of the total prevalence of Alzheimer’s disease is treated with anti-dementia drugs (Koller, Hua, & Bynum 2016).
Growth Rates for the Population	It was assumed that the compound annual growth rate of people with AD is 3.3% for people with mild AD and 3.1% both the moderate and severe stage (Alzheimer’s Association 2015).

HEALTH AND WELLBEING ASSUMPTIONS	
Assumption	Description
Reduction in Use of BPSD Prescription Medication	It was assumed that with music engagement, the use of prescription medication to treat BPSD symptoms for people with AD would decrease. KPMG assumed a 30% decrease in BPSD drug use in people with mild AD , a 16% decrease in the moderate stage , and an 8% decrease in the severe stage .
Reduction in Outpatient Care	It was assumed that with music engagement, the frequency of outpatient care for people with AD would increase by 5% in the mild stage and decrease by 2% in the moderate stage and by 1% in the severe stage . The increase in the mild stage is a result of the need for less inpatient care.
Reduction in Inpatient Hospital Stays	It was assumed that with music engagement, the frequency and duration of stay for inpatient care for people with AD would decrease. KPMG assumed a 15% decrease in the mild stage , an 8% decrease in the moderate stage , and a 4% decrease in the severe stage .
Reduction in Skilled Nursing Facility Stays	It was assumed that with music engagement, the frequency and duration of skilled nursing facility stays for people with Alzheimer’s disease would decrease. KPMG assumed a 15% decrease for people with mild stage AD , an 8% decrease in the moderate stage , and a 4% decrease in the severe stage .
Reduction in Home Healthcare Visits	It was assumed that with music engagement, the frequency of home healthcare visits for people with AD would decrease. KPMG assumed a 10% decrease for people with mild stage AD , a 5% decrease in the moderate stage , and a 2.5% decrease in the severe stage .

¹¹ Note that the sum of these numbers is 6.3 million, due to differences from rounding. The population of people with AD over 65 in the US is 6.2 million.
¹² Derived from the average mortality rate of people age 65 and over in the US in 2018 (Statista 2021).

MUSIC ENGAGEMENT ASSUMPTIONS	
Assumption	Description
Response to Music Engagement	For the analysis, KPMG assumed that the probability of responding positively to music engagement exists at any stage but differs by disease stage and rate of cognitive decline. It was assumed that every individual who responds positively would use somewhat fewer healthcare services and require less care from unpaid caregivers. It was also assumed that not everyone who receives music engagement would have a positive response and would instead have no response (i.e., no change or no reduction in use of healthcare services).
	By stage of disease, KPMG assumed that approximately 52% of people with mild AD would respond positively to music engagement, while approximately 28% of people with moderate AD and approximately 14% of people with severe AD would respond positively.
Music Engagement Session Delivery	It was assumed that 20% of all those with AD who receive music engagement would receive the intervention in an individual session and 80% would receive the intervention in a group setting .
Length and Frequency of Music Engagement Sessions	It was assumed that for both individual and group sessions, there would be 2 30-minute sessions each week .
Average Numbers of Hours Worked by Music Practitioners	It was assumed that each music practitioner spent an average of 35 hours a week providing music engagement sessions.
Average Cost of an Individual Music Session	The average cost of an individual music session in the US in 2020 was \$76.22 per hour (American Music Therapy Association 2020).
Average Cost of a Group Music Session	The average cost of a group music session in the US in 2020 was \$85.38 per hour (American Music Therapy Association 2020).
Average Cost of Music Engagement per Person with AD	Based on music therapy costs obtained from the American Music Therapy Association's 2020 Workforce Analysis (American Music Therapy Association 2020) and KPMG's assumptions on the frequency with which people with AD participate in music engagement, we estimated that the annual average cost of music engagement per person with AD is \$801.57 , with the weekly average cost being \$15.41 (in 2020 dollars).

UNPAID CAREGIVER ASSUMPTIONS	
Assumption	Description
Ability for Caregiver to Reenter the Workforce	It was assumed that with music engagement, unpaid caregivers would be able to increase their hours at work or reenter the workforce. KPMG assumed an additional 1.8 hours of paid work per week for unpaid caregivers caring for someone with mild AD , an additional 1 hour of paid work per week for unpaid caregivers caring for someone with moderate AD , and an additional 0.9 hours of paid work per week for unpaid caregivers caring for someone with severe stage AD . KPMG assumed that each additional hour worked by the caregivers would be compensated at an hourly rate of \$7.25 , the current US federal minimum wage.

ANNUAL AVERAGE TREATMENT COSTS

In order to estimate the impact of music engagement on average costs, KPMG had to first estimate current costs. Based on the assumptions and data discussed above, KPMG was able to estimate the current average annual costs for individuals over age 65 diagnosed with AD.

As the disease progresses, people with AD require more assistance from their caregivers, spend more on medication, and access more health services. It is thus important to factor in differences in costs by stage of disease. For the economic analysis, KPMG assumed that the formal costs of treating Alzheimer’s disease increase by 27% from the mild to moderate stage, and 56% from the moderate to severe stage (equivalent to an increase of 98% from the mild to the severe stage) (Leon & Neumann 1999). KPMG applied these ratios to the average annual overall costs per person with AD to derive the average cost by stage.¹³

Type of Cost (US\$, 2020 Dollars)	Average Overall per Person ¹⁴	Average per Person, Mild AD	Average per Person, Moderate AD	Average per Person, Severe AD
Outpatient care	\$5,862	\$3,946	\$5,012	\$7,818
Inpatient hospital stays	\$11,933	\$8,033	\$10,202	\$15,915
Skilled nursing facility stays	\$7,405	\$4,985	\$6,331	\$9,876
Nursing home stays	\$16,964	\$11,420	\$14,503	\$22,625
Hospice	\$2,240	\$1,508	\$1,915	\$2,987
Home healthcare services	\$2,804	\$1,888	\$2,397	\$3,740
BPSD prescription medications	\$3,534 ¹⁵	\$2,379	\$3,021	\$4,713
Total	\$50,742	\$34,158	\$43,381	\$67,674

ECONOMIC IMPACT MODEL FRAMEWORK

Based on the assumptions and data discussed above, KPMG created a cost model to measure the economic impacts of music engagement for people living with AD, which could directly impact the US economy in three key ways:

- Increased expenditure on music engagement for people with AD.
- Decreased expenditures on medication and healthcare services resulting from improvements in the health and wellbeing of people with AD who respond positively to music engagement.
- Increased employee income earned by unpaid caregivers who are able to work more paid hours due to improvements in the health and wellbeing of people with AD.

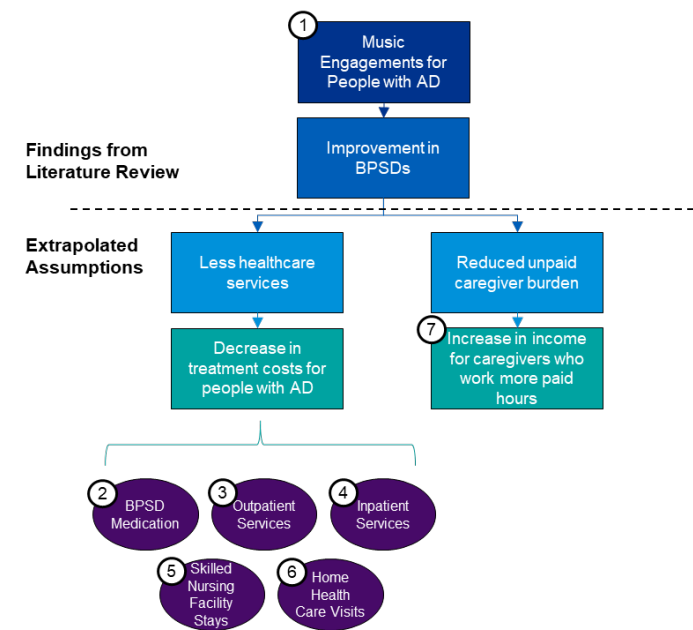
¹³ For example, for outpatient care, the average costs for a mild-stage AD patient total \$3,946. For a moderate-stage AD patient, the average outpatient care costs are 27% higher, which is equal to \$5,012 (= \$3,946 * 127%). For a severe-stage AD patient, the average outpatient care costs are 56% higher than the average outpatient care costs for a moderate-stage AD patient. Thus, for a severe-stage AD patient, the average outpatient care costs are \$7,818 (= \$5,012 * 156%). Then, to arrive at the average overall per person costs for the entire AD population, calculate the sum product of the average outpatient care costs per stage of disease and the proportion of the AD population in each stage of disease (i.e., \$5,862 = [(\$3,946 * 28%) + (\$5,012 * 31%) + (\$7,818 * 41%)]).

¹⁴ The figures in this column were obtained from Alzheimer’s Association (2021b).

¹⁵ Based on the average Medicare spending per beneficiary on BPSD drugs, relative to all drugs used to treat dementia-related symptoms (i.e., BPSD and antidementia drugs), it is assumed that approximately 22% of these total medication costs relate to BPSD drugs, with the remaining 78% related to spending on antidementia drugs.

Within these three areas, KPMG included a total of seven “events” or “shocks” to the economy that are used in the input-output model to measure the economic impact. These seven events are listed below and are also depicted in the accompanying graphic.

- Increased expenditure on music engagement.
- Decreased expenditure on BPSD prescription medication.
- Increased expenditure on outpatient care.
- Decreased expenditure on inpatient hospital stays.
- Decreased expenditure on skilled nursing facility stays.
- Decreased expenditure on home healthcare services.
- Increased employee income earned by unpaid caregivers re-entering the workforce or working more hours.



Phase 3: Input-Output Modeling

METHODOLOGY

The adoption of music engagement for people with AD would result in certain expenditure increases and decreases (i.e., the seven events or shocks described earlier) across the US economy. To assess the economic impact of these changes in spending, KPMG employed economic input-output (I/O) modeling. An I/O analysis is an approach for understanding interindustry relationships within an economy.¹⁶ It captures all monetary market transactions among industries in a given time period. This allows for the effects of a change in one or more economic activities on an entire economy to be examined (impact analysis).

The results of an I/O analysis are broken down into direct, indirect, and induced effects or impacts. The total of these economic impacts is typically greater than the initial economic input.

- **Direct impacts** are the set of expenditures applied to I/O multipliers for an impact analysis.¹⁷ It is one or more production changes or expenditures made by producers/consumers as a result of an activity or policy. Direct effects can be positive or negative.
- **Indirect impacts** are economic effects stemming from business-to-business purchases in the supply chain. When an industry purchases inputs from its suppliers, this spending is shown through the indirect impacts.
- **Induced impacts** are economic effects stemming from household spending of labor income, after removal of taxes, savings, and in-commuter income. Induced impacts are generated by the spending of the employees within the supply chain.

KPMG’s economic impact analysis examined the following economic indicators:

¹⁶ For the I/O analysis KPMG used IMPLAN and the IMPLAN multipliers. IMPLAN is a regional economic analysis software application designed to estimate the impact or ripple effect of a given economic activity within a specific geographic area through the implementation of its I/O model. See IMPLAN (2020).

¹⁷ Multipliers are rates of change that describe how a given change in a particular industry generates impacts in the overall economy (e.g., for every dollar spent in a certain industry, an additional \$0.30 of economic activity is generated locally, implying a multiplier of 1.3).

- **Output.** This is a measure of the total value of goods or services produced within a sector. This measure sums all final outputs and intermediate inputs, and therefore results in the double counting of intermediate purchases.
- **GDP (or value added).** This is a measure of the economic value created through the production of goods or services. It is the value a producer adds to its intermediate inputs by producing its own inputs (i.e., total output less intermediate inputs). GDP is a large component of output.
- **Employment.** This is a measure of the annual average employment that accounts for full-time, part-time, and seasonal jobs within each sector.
- **Labor income.** This is a measure of the total value of all forms of employment income, including employment compensation (wages, salaries, and benefits) and proprietor income. Labor income is a component of GDP.
- **Tax revenues.** This is a measure of personal income taxes, corporate income taxes, property taxes, sales taxes, excise taxes, and custom duties paid to federal, state, county, subcounty general, subcounty special districts, and local governments.

Note that an I/O model is a partial equilibrium model that does not factor in supply-side constraints, input substitution effects, price changes, or household and government budget constraints. Despite its limitations, an I/O model is a commonly used and accepted method for economic impact analysis.

DETERMINING THE INPUTS

KPMG needed to calculate the set of expenditures to be applied against the I/O multipliers to quantify the potential economic impacts. This calculation was performed in three primary steps:

1. KPMG estimated the total population of people with mild, moderate, and severe AD over the next five years.
2. KPMG assumed three different scenarios for the adoption of music engagement, and calculated the population that would participate from Year 1 to Year 5.
3. With respect to the AD population participating in music engagement as determined in step 2, KPMG calculated the negative and positive expenditures associated with each of the seven events or shocks, based on the assumptions described previously.

The results of the calculations from these three steps are summarized below.

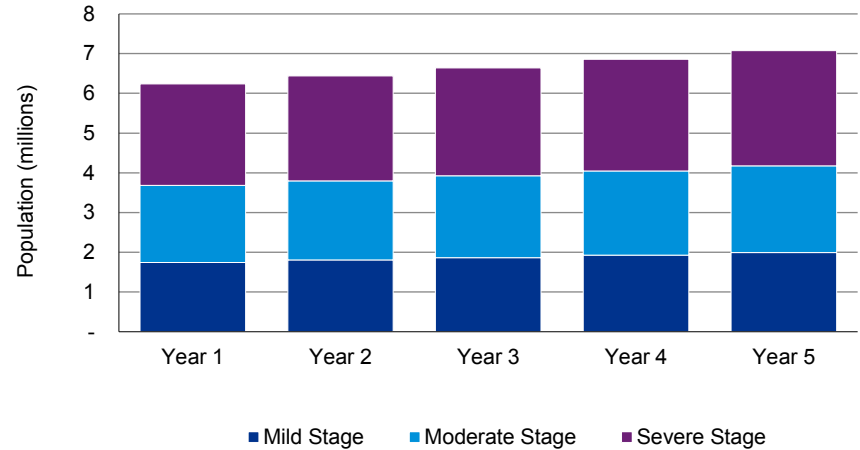
TOTAL POPULATION DATA

The first step in the economic modeling was to determine the total population of people with AD. Following the population assumptions outlined in Phase 3, KPMG modeled the population growth¹⁸ over the next five years as follows:

¹⁸ KPMG assumed that the compound annual growth rate (CAGR) was 3.3.% for people with mild AD and 3.1% for people with both moderate and severe AD. These CAGRs were derived from population forecasts taken from an Alzheimer's Association report.

Total Population (millions)	Year 1	Year 2	Year 3	Year 4	Year 5
Mild Stage	1.75	1.80	1.86	1.93	1.99
Moderate Stage	1.93	1.99	2.06	2.12	2.19
Severe Stage	2.56	2.64	2.72	2.81	2.89
Total Population	6.24	6.44	6.64	6.85	7.07

Total Population Data



MUSIC ENGAGEMENT ADOPTION SCENARIOS

KPMG assumed three scenarios with varying rates of music engagement adoption across the AD population in the US. The scenarios are as follows:

- **Scenario A:** 30% adoption rate.
- **Scenario B:** 50% adoption rate.
- **Scenario C:** 70% adoption rate.

KPMG chose to run three scenarios with different adoption rates to allow for a deeper understanding of how the economic impact may vary with different population samples. We chose 30% as our most conservative adoption rate and 70% as our highest adoption rate, because in our view it would be unrealistic to adopt music engagement as a form of treatment for the entire US population with Alzheimer's disease. We chose 30% and 70% because we wanted to develop a reasonable range around 50%, with a low ratio and a high ratio to avoid extremes in either direction.

In addition, KPMG assumed that not all people with AD who participate in music engagement would respond positively. By stage of disease, it was assumed that approximately 52% of people with mild AD would respond positively, while approximately 28% of people with moderate AD and approximately 14% of people with severe

AD would respond positively. KPMG also assumed that it would take five years to ramp up the music engagement adoption rate to achieve steady state. In other words, adoption rates of 30%, 50%, and 70% would be reached in Year 5. For Scenario A, this assumes a 6% increase in the adoption rate year over year. For Scenario B, this assumes a 10% increase in the adoption rate year over year. For Scenario C, this assumes a 14% increase in the adoption rate year over year.

The following table summarizes the total AD population by each scenario. Note that the figures for each year represent running cumulative totals.

Scenario A (30%): Population Participating in Music Engagement ¹⁹ (millions)	Year 1	Year 2	Year 3	Year 4	Year 5
Mild Stage	0.10	0.22	0.34	0.46	0.60
Moderate Stage	0.12	0.24	0.37	0.51	0.66
Severe Stage	0.15	0.32	0.49	0.67	0.87
Total Population	0.37	0.77	1.20	1.65	2.12
Scenario B (50%): Population Participating in Music Engagement ²⁰ (millions)	Year 1	Year 2	Year 3	Year 4	Year 5
Mild Stage	0.17	0.18	0.56	0.77	0.99
Moderate Stage	0.19	0.40	0.62	0.85	1.09
Severe Stage	0.26	0.53	0.82	1.12	1.45
Total Population	0.62	1.11	1.99	2.74	3.54
Scenario C (70%): Population Participating in Music Engagement ²¹ (millions)	Year 1	Year 2	Year 3	Year 4	Year 5
Mild Stage	0.24	0.51	0.78	1.08	1.39
Moderate Stage	0.27	0.56	0.86	1.19	1.53

¹⁹ As noted earlier, only a portion of those who participate in music engagement would respond positively.

²⁰ As noted earlier, only a portion of those who participate in music engagement would respond positively.

²¹ As noted earlier, only a portion of those who participate in music engagement would respond positively.

Severe Stage	0.36	0.74	1.14	1.57	2.03
Total Population	0.87	1.80	2.79	3.84	4.95

CALCULATING THE COSTS ASSOCIATED WITH EACH EVENT

For each scenario, we calculated the negative and positive costs associated with each of the seven events or shocks, based on our assumptions about the frequency and costs of music engagement, as well as reduced healthcare costs and the ability of caregivers to work more paid hours. In this context, negative costs refer to decreased spending, and positive costs refer to increased spending.

AGGREGATE COSTS ASSOCIATED WITH THE ADOPTION OF MUSIC ENGAGEMENT

The following table summarizes the anticipated negative and positive costs associated with each event, by scenario.

Event	Nature of Activity	Scenario A (30%) (US\$, 2020 dollars)	Scenario B (50%) (US\$, 2020 dollars)	Scenario C (70%) (US\$, 2020 dollars)
Music Engagement	Increased spending	\$1,400,560,693	\$2,334,267,821	\$3,267,974,949
BPSD Prescription Medication	Decreased spending	(\$25,152,920)	(\$41,921,533)	(\$58,690,146)
Outpatient Care	Increased spending	\$33,405,262	\$55,675,436	\$77,945,611
Inpatient Hospital Stays	Decreased spending	(\$601,764,032)	(\$1,002,940,053)	(\$1,404,116,075)
Skilled Nursing Facility Stays	Decreased spending	(\$373,423,503)	(\$622,372,504)	(\$871,321,506)
Home Healthcare Services	Decreased spending	(\$94,267,792)	(\$157,112,987)	(\$219,958,182)
Unpaid Caregiver Reentering Workforce	Increased employee income	\$502,945,182	\$838,241,970	\$1,173,538,757

PER-PERSON TREATMENT COSTS AND SAVINGS ASSOCIATED WITH THE ADOPTION OF MUSIC ENGAGEMENT

Under the model’s assumptions, the average annual treatment costs are \$34,158 for people with mild AD, \$43,381 for people with moderate AD, and \$67,674 for people with severe AD (all in 2020 dollars).

Based on these assumptions, the use of music as a health intervention could result in treatment cost savings for those who respond positively as follows:

Alzheimer’s Disease Stage of People Who Respond Positively to Music Engagement	Estimated Annual Medical Treatment Cost Savings (2020 dollars)
Mild Stage AD	\$2,102
Moderate Stage AD	\$1,636
Severe Stage AD	\$1,324

Note that the costs in the table above were determined by subtracting the reduced total medical treatment costs from the original total medical treatment costs for people with AD who respond positively to music engagement.

Note that under the model’s assumptions, the average annual music engagement costs per person are approximately \$802 (2020 dollars), regardless of the level of disease severity.

ECONOMIC IMPACT ANALYSIS—STEADY STATE

IMPLAN

KPMG then inputted the aggregate negative and positive expenditure and income figures into IMPLAN, a third-party database and software application (IMPLAN 2020). Through IMPLAN’s proprietary software, users can access its input-output model, which combines a set of extensive databases, economic factors, multipliers, and demographic statistics. IMPLAN’s databases carry out economic analyses within the US and can help economists gain insight into an industry’s contributions to a region, quantify the impact of a shock to an economy, or study any other event specific to the economy of a particular region and how it would be impacted. The model identifies direct impacts by sector, and then develops a set of indirect and induced impacts by sector.

INDUSTRY CODES, MULTIPLIERS, AND ECONOMIC ACTIVITIES

The analysis was performed using the IMPLAN input-output model of the US economy. IMPLAN relies on a 546-sector scheme that is mapped to North American Industry Classification Systems (NAICS) industry codes. These 546 sectors group together firms that share similar spending patterns. Sector-specific multipliers are developed based on these common spending patterns. These sector-specific multipliers are applied against the change in economic activity (e.g., industry spending change, industry sales change, employment change, etc.) to estimate the total economic effects of these changes. Thus, it is critical to select the correct sector code in IMPLAN to accurately capture the multiplier effects.

The table below summarizes KPMG’s mapping of each of the seven events to a specific IMPLAN sector and specifies the nature of the economic activity associated with each event.

IMPLAN Sector Code	Event	Economic Activity
485 – Offices of Other Health Practitioners	Increased expenditure on music engagement (Event 1)	Increase in industry output
172 – Pharmaceuticals	Decreased expenditure on BPSD prescription medication (Event 2)	Decrease in industry output
486 – Outpatient Care Centers	Increased expenditure on outpatient care (Event 3)	Increase in industry output
490 – Hospitals	Decreased expenditure on inpatient hospital stays (Event 4)	Decrease in industry output
491 – Nursing and Community Care Facilities	Decreased expenditure on skilled nursing facility stays (Event 5)	Decrease in industry output
488 – Home Healthcare Services	Decreased expenditure on home healthcare services (Event 6)	Decrease in industry output
N/A	Increased labor income earned by caregivers (Event 7)	Increase in employee compensation

SUMMARY OF ECONOMIC IMPACT

KPMG estimated the total potential economic impacts for each of the seven events under each of the three scenarios in Year 5, when steady-state adoption rates would be achieved. These results are summarized in the table below; all economic impact figures are in 2021 dollars.

Potential Economic Impact (2021 dollars)	Scenario A (30%)	Scenario B (50%)	Scenario C (70%)
Output	\$996M	\$1.7B	\$2.3B
GDP	\$830M	\$1.4B	\$1.9B
Employment	7,784 jobs	13,509 jobs	19,234 jobs
Labor Income	\$369M	\$615M	\$861M
Tax Revenues	\$126M	\$210M	\$294M

Scenario A: With a 30% adoption rate, the participation of people with AD in music engagement could generate **total output of \$996 million**, contribute a **total of \$830 million in GDP**, sustain a **total of 7,784 jobs** across the

US, generate a **total of \$369 million in labor income**, and generate a **total of \$126 million in government tax revenues**.

Scenario B: With a 50% adoption rate, the participation of people with AD in music engagement could generate **total output of \$1.7 billion**, contribute a **total of \$1.4 billion in GDP**, sustain a **total of 13,509 jobs** across the US, generate a **total of \$615 million in labor income**, and generate a **total of \$210 million in government tax revenues**.

Scenario C: With a 70% adoption rate, the participation of people with AD in music engagement could generate **total output of \$2.3 billion**, contribute a **total of \$1.9 billion in GDP**, sustain a **total of 19,234 jobs** across the US, generate a **total of \$861 million in labor income**, and generate a **total of \$294 million in government tax revenues**.

The sections that follow discuss in detail the economic impacts generated from (1) the increase in spending on music engagement services, (2) the overall decrease in spending on healthcare services and prescription medication, and (3) the increase in labor income earned by unpaid caregivers.

DETAILED ANALYSIS

ECONOMIC IMPACTS FROM INCREASED EXPENDITURE ON MUSIC ENGAGEMENT SERVICES

Event 1 models the potential economic impact generated due to additional output by the music engagement sector, representing an expansion of the economy. Under all three scenarios, Event 1 generates positive direct effects including additional GDP, supporting more jobs directly in the sector, increasing labor income, and increasing federal, state, county, and incremental tax revenues being earned by federal, state, and county governments. Event 1 also generated positive indirect effects through business-to-business transactions resulting from input purchases. Finally, positive induced effects are generated when employees working in the music engagement sector and the supplier sectors spend their money throughout the economy.

Scenario A (30%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	\$1.4B	\$544M	\$1.3B	\$3.3B
GDP	\$1.1B	\$281M	\$731M	\$2.1B
Employment	13,744 jobs	2,507 jobs	7,102 jobs	23,354 jobs
Labor Income	\$718M	\$163M	\$411M	\$1.3B
Tax Revenues	\$189M	\$55M	\$162M	\$407M

Scenario B (50%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	\$2.4B	\$906M	\$2.2B	\$5.5B
GDP	\$1.8B	\$468M	\$1.2B	\$2.5B
Employment	23,443 jobs	4,179 jobs	11,837 jobs	39,460 jobs
Labor Income	\$1.2B	\$273M	\$687M	\$2.2B
Tax Revenues	\$315M	\$92M	\$270M	\$678M

Scenario C (70%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	\$3.3B	\$1.3B	\$3.0B	\$7.6B
GDP	\$2.5B	\$656M	\$1.7B	\$4.9B
Employment	33,142 jobs	5,850 jobs	16,572 jobs	55,566 jobs
Labor Income	\$1.7B	\$382M	\$961M	\$3.0B
Tax Revenues	\$441M	\$129M	\$379M	\$949M

ECONOMIC IMPACTS FROM DECREASED EXPENDITURES ON HEALTHCARE SERVICES AND MEDICATION

In combination, Events 2 to 6 model the potential economic impact generated due to less overall output by the pharmaceutical sector and other components of the healthcare sector. Together, Events 2 to 6 represent a contraction of the economy; under all three scenarios, there are negative direct effects. These include less GDP; fewer jobs supported directly in the sector (i.e., loss of jobs); a decrease in labor income; and reduced federal, state, county, and local tax revenues. Events 2 to 6 also generate negative indirect effects because lower output means decreased demand for intermediate inputs and consequently fewer business-to-business transactions resulting from input purchases. Finally, negative induced effects are generated when the number of jobs decreases within the healthcare and supplier sectors, because unemployed individuals spend less money throughout the economy.

Scenario A (30%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	(\$1.1B)	(\$783M)	(\$1.2B)	(\$3.0B)
GDP	(\$609M)	(\$409M)	(\$663M)	(\$1.7B)
Employment	(9,208 jobs)	(4,067 jobs)	(6,437 jobs)	(19,712 jobs)
Labor Income	(\$533M)	(\$258M)	(\$373M)	(\$1.2B)
Tax Revenues	(\$144M)	(\$84M)	(\$147M)	(\$376M)

Scenario B (50%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	(\$1.8B)	(\$1.3B)	(\$2.0B)	(\$5.1B)
GDP	(\$1.0B)	(\$682M)	(\$1.1B)	(\$2.8B)
Employment	(15,347 jobs)	(6,778 jobs)	(10,728 jobs)	(32,854 jobs)
Labor Income	(\$889M)	(\$430M)	(\$622M)	(\$1.9B)
Tax Revenues	(\$240M)	(\$140M)	(\$245M)	(\$626M)

Scenario C (70%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	(\$2.5B)	(\$1.8B)	(\$2.7B)	(\$7.1B)
GDP	(\$1.4B)	(\$955M)	(\$1.5B)	(\$3.9B)
Employment	(21,486 jobs)	(9,489 jobs)	(15,019 jobs)	(45,995 jobs)
Labor Income	(\$1.2B)	(\$602M)	(\$871M)	(\$2.7B)
Tax Revenues	(\$336M)	(\$197M)	(\$343M)	(\$876M)

It should be noted that the potential **negative indirect effects** generated from Events 2 to 6, taken together, outweigh the potential positive indirect effects generated from Event 1 in which the output produced by the music engagement sector increases. This is so despite the fact that the increase in output experienced directly by the music engagement sector in Event 1 is greater than the decrease in output experienced directly by the pharmaceutical and healthcare sectors in Events 2 to 6. The explanation is that a lot more supplies are needed to produce pharmaceuticals and to run hospitals and nursing and community care facilities than to provide music engagement services.

Note also that the I/O model is a partial equilibrium model. As such, it is unable to factor into its estimation the economic impact of demand for healthcare services in the US, which generally outpaces the supply. It is therefore rational to assume that the workforce capacity freed up in hospitals and nursing and community care facilities, as well as in home healthcare services (Events 4 to 6), may be redirected to other individuals in need of care, rather than resulting in an economic contraction. If this assumption holds true, then the negative economic impacts resulting from reduced spending on healthcare services (e.g., fewer hospital and skilled nursing facility stays, fewer home healthcare services) by people with AD should be zeroed out and possibly lead to further gains. However, the I/O model does not adjust to this potential new equilibrium.

ECONOMIC IMPACTS FROM INCREASED LABOR INCOME EARNED BY UNPAID CAREGIVERS

Event 7 models the potential induced economic impacts generated due to increased labor income earned by unpaid caregivers representing an expansion of the economy. Under all three scenarios, positive induced effects—in terms of increases in output and GDP, more jobs, additional income, and greater government tax revenues—are generated when these caregivers spend their additional income throughout the economy.

Scenario A (30%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	\$0	\$0	\$761M	\$761M
GDP	\$0	\$0	\$427M	\$427M
Employment	0 jobs	0 jobs	4,147 jobs	4,147 jobs
Labor Income	\$0	\$0	\$240M	\$240M
Tax Revenues	\$0	\$0	\$95M	\$95M

Scenario B (30%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	\$0	\$0	\$1.3B	\$1.3B
GDP	\$0	\$0	\$711M	\$711M
Employment	0 jobs	0 jobs	6,902 jobs	6,902 jobs
Labor Income	\$0	\$0	\$400M	\$400M
Tax Revenues	\$0	\$0	\$158M	\$158M

Scenario C (30%)	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output	\$0	\$0	\$1.8B	\$1.8B
GDP	\$0	\$0	\$996M	\$996M
Employment	0 jobs	0 jobs	9,663 jobs	9,663 jobs
Labor Income	\$0	\$0	\$561M	\$561M
Tax Revenues	\$0	\$0	\$221M	\$221M

OVERALL DIRECT, INDIRECT, AND INDUCED EFFECTS BY SCENARIO

The figures below provide a breakdown of the potential direct, indirect, and induced effects generated by the seven events in aggregate, under each of the three scenarios. While the aggregate direct and aggregate induced effects are positive, the aggregate indirect effects are negative. Nonetheless, in each scenario, **the total impact (direct + indirect + induced) is positive, meaning under the assumptions in this report the provision of music engagement as a treatment for older US individuals diagnosed with AD is estimated to have a positive impact on the US economy.**

SCENARIO A (30%)

	Direct Impact		Indirect Impact		Induced Impact		Total Impact
Output	352M	+	-240M	+	883M	=	996M
GDP	463M	+	-128M	+	495M	=	830M
Employment	4,536	+	-1,560	+	4,807		7,784
Labor Income	185M	+	-95M	+	279M	=	369M
Tax Revenues	45M	+	-29M	+	110M	=	126M
	Impacts generated directly within the subsectors		Impacts within suppliers to the subsectors		Impacts from the spending of Labor Income earned through direct and indirect impacts		

SCENARIO C (70%)

	Direct Impact		Indirect Impact		Induced Impact		Total Impact
Output	822M	+	-559M	+	2.06B	=	2.32B
GDP	1.08B	+	-299M	+	1.15B	=	1.94B
Employment	11,656	+	-3,639	+	11,217		19,234
Labor Income	431M	+	-221M	+	651M	=	861M
Tax Revenues	105M	+	-68M	+	256M	=	294M
	Impacts generated directly within the subsectors		Impacts within suppliers to the subsectors		Impacts from the spending of Labor Income earned through direct and indirect impacts		

SCENARIO B (50%)

	Direct Impact		Indirect Impact		Induced Impact		Total Impact
Output	587M	+	-399M	+	1.47B	=	1.66B
GDP	772M	+	-214M	+	825M	=	1.38B
Employment	8,096	+	-2,599	+	8,012		13,509
Labor Income	308M	+	-158M	+	465M	=	615M
Tax Revenues	75M	+	48M	+	183M	=	210M
	Impacts generated directly within the subsectors		Impacts within suppliers to the subsectors		Impacts from the spending of Labor Income earned through direct and indirect impacts		

Recommended Next Steps

Based on this analysis, KPMG recommends the following next steps for future understanding of the economic impact of music engagement and other art modalities as interventions to advance health and wellbeing for all:

FURTHER SCIENTIFIC RESEARCH ON THE EFFICACY OF MUSIC ENGAGEMENT AS AN INTERVENTION

While there is some literature on the efficacy of music engagement on Alzheimer’s disease, more robust scientific research is needed. Current limitations are primarily due to a lack of consistency in the methodology across studies, such as variances in number of participants, participant age, disease severity, cognitive level, outcome measures, type of intervention (active versus passive), and length of intervention. Further, many of the existing studies have very small sample sizes and are not RCTs. Larger sample sizes increase the likelihood of statistically significant results; RCTs would provide the most reliable evidence of the effectiveness of the music interventions because they minimize the risk of confounding factors.

Given the potential benefits of music engagement on people with AD, their caregivers, and the community in terms of improved health, wellbeing, and quality of life, the next step is to pursue further scientific research in this area.

CONDUCT A MORE COMPREHENSIVE ANALYSIS TO EXAMINE IMPACT ON QUALITY OF LIFE

The scientific studies we reviewed provide evidence that quality of life for individuals with AD can be positively impacted by music engagement. Music can also positively impact the QoL of caregivers and families. QoL encompasses life satisfaction, including physical health, emotional wellbeing, social relationships, quality of environment, work, financial and material wellbeing, personal safety, and a sense of belonging. This economic analysis has not measured those impacts.

Given the potential importance of this measure of health and wellbeing, KPMG recommends that the analysis be expanded to consider QoL benefits of music engagement for people with AD, their families, and other caregivers.

CONDUCT ANALYSES IN OTHER COUNTRIES

The increasing prevalence of Alzheimer’s disease is a global concern; indeed, the World Health Organization has called it a public health priority (World Health Organization 2021). Given this, and the ease and low cost associated with providing art-based treatments, it would be valuable to conduct similar economic (and social) analyses in other countries to further assess and potentially establish neuroarts as a viable and cost-effective intervention for people with AD.

CONDUCT ANALYSES OF THE ECONOMIC IMPACTS OF OTHER ART-BASED INTERVENTIONS ON ALZHEIMER’S DISEASE

Music engagement is one of several potential art modalities that could be used to enhance the health and wellbeing of people with AD. Other potential art modalities include dance and movement, theatre, visual arts, and more (NeuroArts Blueprint 2021). This analysis could be advanced by performing a multimodal analysis that evaluates economic impacts under a scenario where people with AD experience more than one type of art intervention.

CONDUCT ANALYSES OF THE ECONOMIC IMPACTS OF MUSIC AND OTHER ART MODALITIES ON OTHER HEALTH CONDITIONS

The model developed for this economic analysis could be applied to evaluate the economic impact of other types of art-based interventions on other populations with a range of mental and physical health conditions. Expanding such work to include QoL analyses would also lead to a more comprehensive understanding of the economic, social, and health impacts of various art modalities on different populations.

The potential contribution of these analyses depends on the availability of quality research measuring the impact of art-based interventions on health and wellbeing—that is, the power of the economic assessments is directly correlated with the strength of the underlying research. As neuroarts research progresses, so too will the value of economic analyses in furthering the goals of the *NeuroArts Blueprint*.

Appendix 1

References

Alzheimer's Association. (2015). Changing the trajectory of Alzheimer's disease: How a treatment by 2025 saves lives and dollars. Retrieved November 22, 2021, from <https://www.alz.org/media/Documents/changing-the-trajectory-r.pdf>.

Alzheimer's Association. (2021a). Retrieved November 22, 2021, from <https://www.alz.org/>.

Alzheimer's Association. (2021b). Alzheimer's and dementia: Facts and figures. Retrieved November 22, 2021, from <https://www.alz.org/alzheimers-dementia/facts-figures>.

Alzheimer's Association. (2021c). Medications for memory, cognition, and dementia-related behaviors. Retrieved November 22, 2021, from <https://www.alz.org/alzheimers-dementia/treatments/medications-for-memory>.

Alzheimer's Association. (2021d). Treatments for behavior. Retrieved November 22, 2021, from <https://www.alz.org/alzheimers-dementia/treatments/treatments-for-behavior>.

American Music Therapy Association. (2020). AMTA member survey and workforce analysis: A descriptive, statistical profile of the AMTA membership and the music therapy community. Silver Spring, MD: American Music Therapy Association.

American Music Therapy Association. (2021a). Retrieved November 22, 2021, from <https://www.musictherapy.org/>.

Ceccato, E., Vigato, G., & Bonetto, C. (2012, July 19). STAM protocol in dementia: A multicenter, single-blind, randomized, and controlled trial. *American Journal of Alzheimer's Disease & Other Dementias*, 25(7): 301–10. Retrieved November 22, 2021, from DOI: 10.1177/1533317512452038.

Centers for Disease Control and Prevention. (n.d.). Retrieved November 22, 2021, from <https://www.cdc.gov/>.

Centers for Medicare & Medicaid Services (2020a, December 22). Medicaid Drug Spending Dashboard. Retrieved November 22, 2021, from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Information-on-Prescription-Drugs/Medicaid>.

Centers for Medicare & Medicaid Services. (2020b, December 22). Medicare Part D Drug Spending Dashboard. Retrieved November 22, 2021, from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Information-on-Prescription-Drugs/MedicarePartD>.

Centers for Medicare & Medicaid Services. (n.d.). Retrieved November 22, 2021, from <https://www.cms.gov/>.

Clouse, Candi. (2021, April). About IMPLAN. Retrieved November 22, 2021, from <https://support.implan.com/hc/en-us/articles/360044985833-About-IMPLAN>.

Cooper, C., et al. (2012, June). Systematic review of the effectiveness of non-pharmacological interventions to improve quality of life of people with dementia. *International Psychogeriatrics*, 24(6): 856–70. Retrieved November 22, 2021, from doi10.1017/S1041610211002614.

Dementia Care Central (2020, April 24). Stages of Alzheimer's and dementia: Durations and scales used to measure progression (GDS, FAST, and CDR). Retrieved November 22, 2021, from <https://www.dementiacarecentral.com/aboutdementia/facts/stages/>.

Guétin, S., Portet, F., Picot, M. C., Pommié, C., Messaoudi, M., Djabelkir, L., et al. (2009). Effect of music therapy on anxiety and depression in patients with Alzheimer's type dementia: Randomised, controlled study. *Dementia and Geriatric Cognitive Disorders*, 28(1): 36–46. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/19628939/>.

IMPLAN. (2020). Retrieved November 22, 2021, from <https://implan.com/>.

Kishita, N., Backhouse, T., & Mioshi, E. (2020, January). Nonpharmacological interventions to improve depression, anxiety and quality of life (QoL) in people with dementia: An overview of systematic reviews. *Journal of Geriatric Psychiatry and Neurology*, 33(1): 28–41. Retrieved November 22, 2021, from doi: 10.1177/0891988719856690.

Koller, D., Hua, T., & Bynum, J. P. W. (2016, August). Treatment patterns with antidementia drugs in the United States: Medicare cohort study. *Journal of the American Geriatric Society*, 64(8): 1540–48. Retrieved November 22, 2021, from doi: 10.1111/jgs.14226.

Lam, H. L., Li, W. T. V., Laher, I., & Wong, R. Y. (2020, September). Effects of music therapy on patients with dementia—a systematic review. *Geriatrics*, 5(4): 62. Retrieved November 22, 2021, from <https://www.mdpi.com/2308-3417/5/4/62>.

Leggieri, M., Thaut, M. H., Fornazzari, L., Schweizer, T. A., Barfett, J., et al. (2019, March 12). Music intervention approaches for Alzheimer's disease: A review of the literature. *Frontiers in Neuroscience*, 13: 132. Retrieved November 22, 2021, from <https://doi.org/10.3389/fnins.2019.00132>.

Leon, J. L., & Neumann, P. J. (1999, July). The cost of Alzheimer's disease in managed care: A cross-sectional study. *American Journal of Managed Care*, 5(7): 867–77. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/10557408/>.

McDermott, O., Crellin, N., Ridder, H. M., Orrell, M. (2013, August). Music therapy in dementia: A narrative synthesis systematic review. *International Journal of Geriatric Psychiatry*, 28(8): 781–94. Retrieved November 22, 2021, from doi: 10.1002/gps.3895.

McDermott, O., Orrell, M., & Ridder, H. M. (2014, January 13). The importance of music for people with dementia: The perspectives of people with dementia, family carers, staff and music therapists. *Aging & Mental Health*, 18(6), 706–16. Retrieved November 22, 2021, from doi: 10.1080/13607863.2013.875124.

Mittelman, M. S., & Papayannopoulou, P. M. (2018, January 29). The unforgettables: A chorus for people with dementia with their family members and friends. *International Psychogeriatrics*, 30(6): 779–89. Retrieved November 22, 2021, from <https://doi.org/10.1017/s1041610217001867>.

Moreno-Morales, C., Calero, R., Moreno-Morales, R., & Pintado, C. (2020, May 19). Music therapy in the treatment of dementia: A systematic review and meta-analysis. *Frontiers in Medicine*, 7(160). Retrieved November 22, 2021, from <https://doi.org/10.3389/fmed.2020.00160>.

National Institute on Aging. (n.d.). Cognitive health and older adults. Retrieved November 22, 2021, from <https://www.nia.nih.gov/health/cognitive-health-and-older-adults#:~:text=Dementia%20is%20the%20loss%20of,visual%20perception%2C%20or%20paying%20attention>.

NeuroArts Blueprint. (2021, December 1). *NeuroArts Blueprint*. NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing. Retrieved November 22, 2021, from www.neuroartsblueprint.org.

Pedersen, S. K. A., Andersen, P. N., Lugo, R. G., Andreassen, M., & Sütterlin, S. (2017, May 16). Effects of music on agitation in dementia: A meta-analysis. *Frontiers in Psychology*, 8(742). Retrieved November 22, 2021, from <https://doi.org/10.3389/fpsyg.2017.00742>.

Peripheral and Central Nervous System Drugs Advisory Committee Meeting. (2020, November 6). Combined FDA and applicant PCNS Drugs Advisory Committee briefing document. Retrieved November 22, 2021, from <https://www.fda.gov/media/143502/download>.

Raglio, A., Bellandi, D., Baiardi, P., Gianotti, M., Ubezio, M. C., et al. (2015, August). Effect of active music therapy and individualized listening to music on dementia: A multicenter randomized controlled trial. *Journal of the American Geriatrics Society*, 63(8): 1534–39. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/26289682/>.

Ridder, H. M. O., Stige, B., Qvale, L. G., & Gold, C. (2013, April 27). Individual music therapy for agitation in dementia: An exploratory randomized controlled trial. *Aging & Mental Health*, 17(6): 667–78. Retrieved November 22, 2021, from <http://dx.doi.org/10.1080/13607863.2013.790926>.

Sakamoto, M., Ando, H., & Tsutou A. (2013). Comparing the effects of different individualized music interventions for elderly individuals with severe dementia. *International Psychogeriatrics*, 25(5): 775–84. Retrieved November 22, 2021, from [doi:10.1017/S1041610212002256](https://doi.org/10.1017/S1041610212002256).

Sittler, M. C., Worshech, F., Wilz, G., Fellgiebel, A., & Wuttke-Linnemann. (2021, May 1). Psychobiological mechanisms underlying the health-beneficial effects of music in people living with dementia: A systematic review of the literature. *Physiology & Behavior*, 233: 113338. Retrieved November 22, 2021, from <https://doi.org/10.1016/j.physbeh.2021.113338>.

Statista. (2021, May 11). Death rates for all causes in the U.S., 1950–2018. Retrieved November 22, 2021, from <https://www.statista.com/statistics/189670/death-rates-for-all-causes-in-the-us-since-1950/>.

Sung, H., Lee, W., Li, T., & Watson, R. (2012, June). A group music intervention using percussion instruments with familiar music to reduce anxiety and agitation of institutionalized older adults with dementia. *International Journal of Geriatric Psychiatry*, 27(6): 621–27. Retrieved November 22, 2021, from [doi:10.1002/gps.2761](https://doi.org/10.1002/gps.2761).

van der Steen J. T., van Soest-Poortvliet, M. C., van der Wouden, J. C., Bruinsma, M. S., Scholten, R. J. P. M., & Vink, A. C. (2017). Music-based therapeutic interventions for people with dementia. *Cochrane Database of Systematic Reviews* 5, CD003477. Retrieved November 22, 2021, from <https://doi.org/10.1002/14651858.cd003477.pub3>.

Vasionyte, I., & Madison, G. (2013, April). Musical intervention for patients with dementia: a meta-analysis. *Journal of Clinical Nursing*, 22(9–10): 1203–16. Retrieved November 22, 2021, from <https://doi.org/10.1111/jocn.12166>.

Vink, A., & Hanser, S. (2018, October). Music-based therapeutic interventions for people with dementia: A mini-review. *Medicines (Basel)*, 5(4): 109. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/30297605/>.

World Health Organization. (2021, September 2). Dementia. Retrieved November 22, 2021, from <https://www.who.int/news-room/fact-sheets/detail/dementia>.

Zhang, Y., Cai, J., An, L., Hui, F., Ren, T., et al. (2016). Does music therapy enhance behavioral and cognitive function in elderly dementia patients? A systematic review and meta-analysis. *Aging Research Reviews* 35(2017): 1–11. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/28025173/>.

Appendix 2

Bibliography

Alzheimer's Association. (2021). Alzheimer's and dementia: Facts and figures. Retrieved November 22, 2021, from <https://www.alz.org/alzheimers-dementia/facts-figures>.

Alzheimer's Association. (2021). Medications for memory, cognition, and dementia-related behaviors. Retrieved November 22, 2021, from <https://www.alz.org/alzheimers-dementia/treatments/medications-for-memory>.

Alzheimer's Association. (2021). Retrieved November 22, 2021, from <https://www.alz.org/>.

Alzheimer's Association. (2021). Treatments for behavior. Retrieved November 22, 2021, from <https://www.alz.org/alzheimers-dementia/treatments/treatments-for-behavior>.

Alzheimer's Association. (2021). Types of dementia. Retrieved November 22, 2021, from <https://www.alz.org/alzheimers-dementia/what-is-dementia/types-of-dementia>

American Music Therapy Association. (2020). AMTA member survey and workforce analysis: A descriptive, statistical profile of the AMTA membership and the music therapy community. Silver Spring, MD: American Music Therapy Association.

American Music Therapy Association. (2021). Retrieved November 22, 2021, from <https://www.musictherapy.org/>.

Ceccato, E., Vigato, G., & Bonetto, C. (2012, July 19). STAM protocol in dementia: A multicenter, single-blind, randomized, and controlled trial. *American Journal of Alzheimer's Disease & Other Dementias*, 25(7): 301–10. Retrieved November 22, 2021, from DOI: 10.1177/1533317512452038.

Centers for Disease Control and Prevention. (n.d.). Retrieved November 22, 2021, from <https://www.cdc.gov/>.

Centers for Medicare & Medicaid Services. (n.d.). Retrieved November 22, 2021, from <https://www.cms.gov/>.

Clouse, Candi. (2021, April). About IMPLAN. Retrieved November 22, 2021, from <https://support.implan.com/hc/en-us/articles/360044985833-About-IMPLAN>.

Cooper, C., et al. (2012, June). Systematic review of the effectiveness of non-pharmacological interventions to improve quality of life of people with dementia. *International Psychogeriatrics*, 24(6): 856–70. Retrieved November 22, 2021, from doi:10.1017/S1041610211002614.

Davalos, D. B., Luxton, I., Thaut, M., & Cross, J. E. (2019). B Sharp—The cognitive effects of a pilot community music program for people with dementia-related disorders. *Alzheimer's Dementia (NY)*, 5: 592–96. Retrieved November 22, 2021, from doi:10.1016%2Fj.trci.2019.08.004.

Dementia Care Central (2020, April 24). Stages of Alzheimer's and dementia: Durations and scales used to measure progression (GDS, FAST, and CDR). Retrieved November 22, 2021, from <https://www.dementiacarecentral.com/aboutdementia/facts/stages/>.

Fang, R., Ye, S., Huangfu, J., & Calimag, D. P. (2017). Music therapy is a potential intervention for cognition of Alzheimer's disease: A mini-review. *Translational Neurodegeneration*, 6: 2. Retrieved November 22, 2021, from doi: 10.1186/s40035-017-0073-9

Gerdner, L. A. (2011). Individualized music for dementia: Evolution and application of evidence-based protocol. *World Journal of Psychiatry*, 2(2): 26–32. Retrieved November 22, 2021, from doi:10.5498/wjp.v2.i2.26.

Global Council on Brain Health. (2020). Music on our minds: The rich potential of music to promote brain health and mental well-being. Retrieved November 22, 2021, from doi:10.26419/pia.00103.001.

Gooding, L. F., Abner, E. L., Jicha, G. A., Kryscio, R. J., & Schmitt, F. A. (2014, June). Musical training and late-life cognition. *American Journal of Alzheimer's Disease and Other Dementias*, 29(4): 333–43. Retrieved November 22, 2021, from doi: 10.1177/1533317513517048.

Groussard, M., Chan, T. G., Coppalle, R., & Platel, H. (2019). Preservation of musical memory throughout the progression of Alzheimer's disease? Toward a reconciliation of theoretical, clinical, and neuroimaging evidence. *Journal of Alzheimer's Disease*, 68(3): 857–83. Retrieved November 22, 2021, from doi: 10.3233/jad-180474.

Guétin, S., Portet, F., Picot, M. C., Pommié, C., Messaoudi, M., Djabelkir, L., et al. (2009). Effect of music therapy on anxiety and depression in patients with Alzheimer's type dementia: Randomised, controlled study. *Dementia and Geriatric Cognitive Disorders*, 28(1): 36–46. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/19628939/>.

IMPLAN. (2020). Retrieved November 22, 2021, from <https://implan.com/>.

International Arts & Mind Lab Center for Applied Neuroaesthetics. (n.d.). Frequently asked questions. Retrieved November 22, 2021, from <https://www.artsandmindlab.org/frequently-asked-questions/>.

Jacobsen, J. H., Stelzer, J., Fritz, T. H., Chételat, G., La Joie, R., & Turner, R. (2015, August). Why musical memory can be preserved in advanced Alzheimer's disease. *Brain*, 138(8): 2438–50. Retrieved November 22, 2021, from doi:10.1093/brain/awv135.

Kishita, N., Backhouse, T., & Mioshi, E. (2020, January). Nonpharmacological interventions to improve depression, anxiety and quality of life (QoL) in people with dementia: An overview of systematic reviews. *Journal of Geriatric Psychiatry and Neurology*, 33(1): 28–41. Retrieved November 22, 2021, from doi: 10.1177/0891988719856690.

Koger, S. M., & Brotons, M. (2000). Music therapy for dementia symptoms. *Cochrane Database of Systematic Reviews* 2: CD001121. Retrieved from doi:10.1002/14651858.cd001121.

Koller, D., Hua, T., & Bynum, J. P. W. (2016, August). Treatment patterns with antidementia drugs in the United States: Medicare cohort study. *Journal of the American Geriatric Society*, 64(8): 1540–48. Retrieved November 22, 2021, from doi: 10.1111/jgs.14226.

Kubendran, S., DeVol, R., & Chatterjee, A. (2016, March). The price women pay for dementia: Strategies to ease gender disparity and economic costs. Milken Institute. Retrieved November 22, 2021, from https://milkeninstitute.org/sites/default/files/reports-pdf/The%20Price%20Women%20Pay%20for%20Dementia-Strategies%20to%20Ease%20Gender%20Disparity%20and%20Economic%20Costs_0.pdf.

Lam, H. L., Li, W. T. V., Laher, I., & Wong, R. Y. (2020, September). Effects of music therapy on patients with dementia—a systematic review. *Geriatrics*, 5(4): 62. Retrieved November 22, 2021, from <https://www.mdpi.com/2308-3417/5/4/62>.

Legere, L. E., McNeill, S., Martin, L. S., Acorn, M., & An, D. (2018, April). Nonpharmacological approaches for behavioural and psychological symptoms of dementia in older adults: A systematic review of reviews. *Journal of Clinical Nursing*, 27(7–8): e1360–e1376. Retrieved November 22, 2021, from doi:10.1111/jocn.14007.

Leggieri, M., Thaut, M. H., Fornazzari, L., Schweizer, T. A., Barfett, J., et al. (2019, March 12). Music intervention approaches for Alzheimer's disease: A review of the literature. *Frontiers in Neuroscience*, 13: 132. Retrieved November 22, 2021, from <https://doi.org/10.3389/fnins.2019.00132>.

Leon, J. L., & Neumann, P. J. (1999, July). The cost of Alzheimer's disease in managed care: A cross-sectional study. *American Journal of Managed Care*, 5(7): 867–77. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/10557408/>.

Li, H.-C., Wang, H.-H., Chou, F.-H., & Chen, K.-M. (2015, January). The effect of music therapy on cognitive functioning among older adults: a systematic review and meta-analysis. *Journal of the American Medical Directors Association*, 16(1): 71–77. Retrieved November 22, 2021, from doi:10.1016/j.jamda.2014.10.004.

Livingston, G., Huntley, J., Sommerlad, A., Ames, D., Ballard, C., Banerjee, S., et al. (2020, August 8). Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet*, 396(10248): 413–46. Retrieved November 22, 2021, from doi:10.1016/S0140-6736(20)30367-6.

Mansbach, W. E., Mace, R. A., & Clark, K. M. (2016). Mild cognitive impairment (MCI) in long-term care patients: Subtype classification and occurrence. *Aging & Mental Health*, 20(3): 271–76. Retrieved November 22, 2021, from doi:10.1080/13607863.2014.1003283.

Mansbach, W. E., Mace, R. A., Clark, K. M., & Firth, I. M. (2017, June). Meaningful activity for long-term care residents with dementia: A comparison of activities and raters. *Gerontologist*, 57(3), 461–68. Retrieved November 22, 2021, from doi:10.1093/geront/gnv694.

McDermott, O., Crellin, N., Ridder, H. M., Orrell, M. (2013, August). Music therapy in dementia: A narrative synthesis systematic review. *International Journal of Geriatric Psychiatry*, 28(8): 781–94. Retrieved November 22, 2021, from doi: 10.1002/gps.3895.

McDermott, O., Orrell, M., & Ridder, H. M. (2014, January 13). The importance of music for people with dementia: The perspectives of people with dementia, family carers, staff and music therapists. *Aging & Mental Health*, 18(6), 706–16. Retrieved November 22, 2021, from doi: 10.1080/13607863.2013.875124.

Mittelman, M. S., & Papayannopoulou, P. M. (2018, January 29). The unforgettable: A chorus for people with dementia with their family members and friends. *International Psychogeriatrics*, 30(6): 779–89. Retrieved November 22, 2021, from <https://doi.org/10.1017/s1041610217001867>.

Moreno-Morales, C., Calero, R., Moreno-Morales, R., & Pintado, C. (2020, May 19). Music therapy in the treatment of dementia: A systematic review and meta-analysis. *Frontiers in Medicine*, 7(160). Retrieved November 22, 2021, from <https://doi.org/10.3389/fmed.2020.00160>.

National Institute on Aging. (n.d.). Cognitive health and older adults. Retrieved November 22, 2021, from <https://www.nia.nih.gov/health/cognitive-health-and-older-adults#:~:text=Dementia%20is%20the%20loss%20of,visual%20perception%2C%20or%20paying%20attentio>.

NeuroArts Blueprint. (2021, December 1). *NeuroArts Blueprint*. NeuroArts Blueprint: Advancing the Science of Arts, Health, and Wellbeing. Retrieved November 22, 2021, from www.neuroartsblueprint.org.

Park, H. (2010, September). Effect of music on pain for home-dwelling persons with dementia. *Pain Management Nursing*, 11(3): 141–47. Retrieved November 22, 2021, from doi:10.1016/j.pmn.2009.05.004.

Pedersen, S. K. A., Andersen, P. N., Lugo, R. G., Andreassen, M., & Sütterlin, S. (2017, May 16). Effects of music on agitation in dementia: A meta-analysis. *Frontiers in Psychology*, 8(742). Retrieved November 22, 2021, from <https://doi.org/10.3389/fpsyg.2017.00742>.

Peripheral and Central Nervous System Drugs Advisory Committee Meeting. (2020, November 6). Combined FDA and applicant PCNS Drugs Advisory Committee briefing document. Retrieved November 22, 2021, from <https://www.fda.gov/media/143502/download>.

Pongan, E., Tillmann, B., Leveque, Y., Trombert, B., Getenet, J. C., Auguste, N., et al. (2017). Can musical or painting interventions improve chronic pain, mood, quality of life, and cognition in patients with mild Alzheimer's disease? Evidence from a randomized controlled trial. *Journal of Alzheimer's Disease*, 60(2): 663–77. Retrieved November 22, 2021, from doi:10.3233/jad-170410.

Raglio, A., Bellandi, D., Baiardi, P., Gianotti, M., Ubezio, M. C., et al. (2015, August). Effect of active music therapy and individualized listening to music on dementia: A multicenter randomized controlled trial. *Journal of the American Geriatrics Society*, 63(8): 1534–39. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/26289682/>.

Ridder, H. M. O., Stige, B., Qvale, L. G., & Gold, C. (2013, April 27). Individual music therapy for agitation in dementia: An exploratory randomized controlled trial. *Aging & Mental Health*, 17(6): 667–78. Retrieved November 22, 2021, from <http://dx.doi.org/10.1080/13607863.2013.790926>.

Rio, R. (2018, November). A community-based music therapy support group for people with Alzheimer's disease and their caregivers: A sustainable partnership model. *Frontiers in Medicine (Lausanne)*, 5(293). Retrieved November 22, 2021, from DOI:10.3389/fmed.2018.00293.

Sakamoto, M., Ando, H., & Tsutou A. (2013). Comparing the effects of different individualized music interventions for elderly individuals with severe dementia. *International Psychogeriatrics*, 25(5): 775–84. Retrieved November 22, 2021, from doi:10.1017/S1041610212002256.

Sittler, M. C., Worshech, F., Wilz, G., Fellgiebel, A., & Wuttke-Linnemann. (2021, May 1). Psychobiological mechanisms underlying the health-beneficial effects of music in people living with dementia: A systematic review of the literature. *Physiology & Behavior*, 233: 113338. Retrieved November 22, 2021, from <https://doi.org/10.1016/j.physbeh.2021.113338>.

Sung, H., Lee, W., Li, T., & Watson, R. (2012, June). A group music intervention using percussion instruments with familiar music to reduce anxiety and agitation of institutionalized older adults with dementia. *International Journal of Geriatric Psychiatry*, 27(6): 621–27. Retrieved November 22, 2021, from doi: 10.1002/gps.2761.

Super, N., Ahuja, R., & Proff, K. (2019). Reducing the cost and risk of dementia: Recommendations to improve brain health and decrease disparities. Milken Institute. Retrieved November 22, 2021, from https://milkeninstitute.org/sites/default/files/reports-pdf/Reducing%20the%20Cost%20and%20Risk%20of%20Dementia%20Full%20Report-FINAL-for-posting_0.pdf.

US Food and Drug Administration. (2021, July 8). Aducanumab (marketed as Aduhelm) information. Retrieved November 22, 2021, from <https://www.fda.gov/drugs/postmarket-drug-safety-information-patients-and-providers/aducanumab-marketed-aduhelm-information>.

van der Steen J. T., van Soest-Poortvliet, M. C., van der Wouden, J. C., Bruinsma, M. S., Scholten, R. J. P. M., & Vink, A. C. (2017). Music-based therapeutic interventions for people with dementia. *Cochrane Database of Systematic Reviews* 5, CD003477. Retrieved November 22, 2021, from <https://doi.org/10.1002/14651858.cd003477.pub3>.

Vasionyte, I., & Madison, G. (2013, April). Musical intervention for patients with dementia: a meta-analysis. *Journal of Clinical Nursing*, 22(9–10): 1203–16. Retrieved November 22, 2021, from <https://doi.org/10.1111/jocn.12166>.

Vink, A., & Hanser, S. (2018, October). Music-based therapeutic interventions for people with dementia: A mini-review. *Medicines (Basel)*, 5(4): 109. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/30297605/>.

Vink, A., Zuidersma, M., Boersma, F., de Jonge, P., Zuidema, S. U., & Slaets, J. P. J. (2013). The effect of music therapy compared with general recreational activities in reducing agitation in people with dementia: A randomised controlled trial. *International Journal of Geriatric Psychiatry*, 28(10): 1031–38. Retrieved November 22, 2021, from doi:10.1002/gps.3924.

Voisin, T., & Vellas, B. (2009). Diagnosis and treatment of patients with severe Alzheimer’s disease. *Drugs & Aging*, 26(2): 135–44. Retrieved November 22, 2021, from doi: 10.2165/0002512-200926020-00005.

World Health Organization. (2021, September 2). Dementia. Retrieved November 22, 2021, from <https://www.who.int/news-room/fact-sheets/detail/dementia>.

Yuan, J., Maserejian, N., Liu, Y., Devine, S., Gillis, C., et al. (2021). Severity distribution of Alzheimer’s disease dementia and mild cognitive impairment in the Framingham Heart Study. *Journal of Alzheimer’s Disease*, 79(2): 807–17. Retrieved November 22, 2021, from doi: 10.3233/JAD-200786.

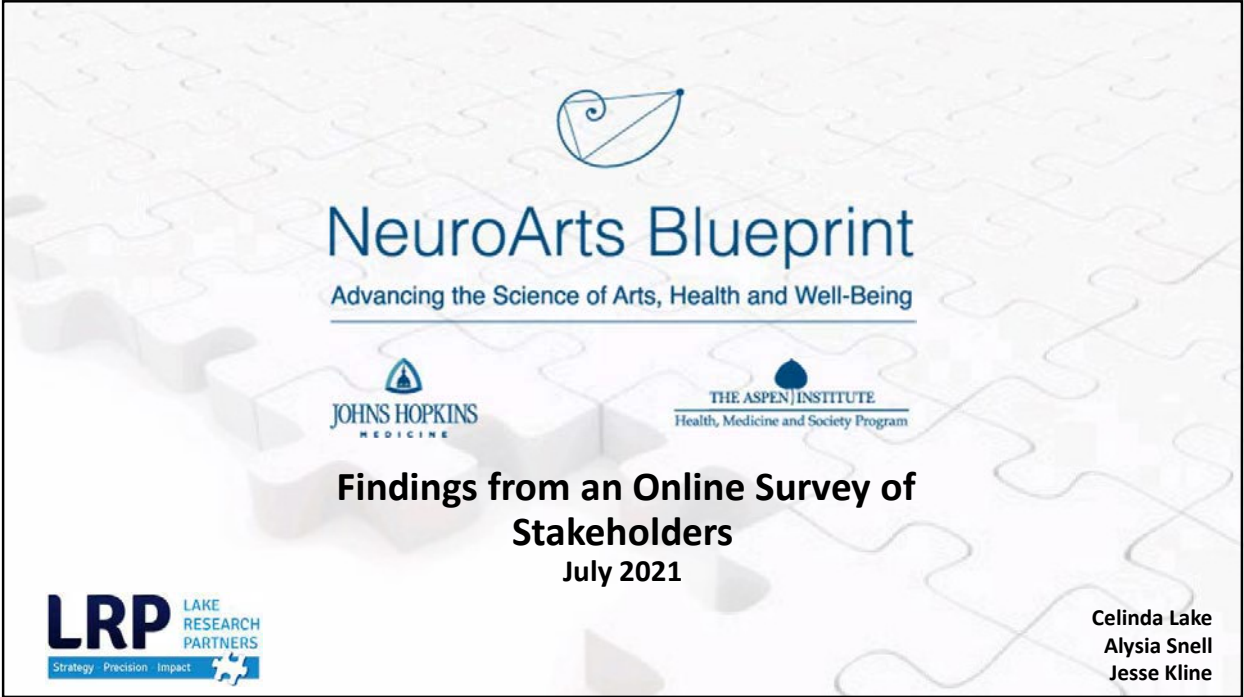
Zhang, Y., Cai, J., An, L., Hui, F., Ren, T., et al. (2016). Does music therapy enhance behavioral and cognitive function in elderly dementia patients? A systematic review and meta-analysis. *Aging Research Reviews* 35(2017): 1–11. Retrieved November 22, 2021, from <https://pubmed.ncbi.nlm.nih.gov/28025173/>.

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Findings from an Online Survey of Stakeholders



1


Research Methodology



Lake Research Partners designed and administered this online survey that was conducted from February 8 – June 8, 2021. The survey is part of a research study conducted on behalf of the NeuroArts Blueprint: The Science of Arts, Health, and Well-Being. The survey reached a total of 304 stakeholders (researchers, healthcare practice, artists and cultural influencers, health policy, philanthropy, technology, and business).

The sample was drawn from a list of stakeholders provided by the NeuroArts Blueprint. The sample was not weighted, but core demographics and responses to questions 3, 11, and 12 were evened across splits in the data.

The margin of error for the total sample is +/- 5.6%. In interpreting survey results, all sample surveys are subject to possible sampling error; that is, the results of a survey may differ from those which would be obtained if the entire population were interviewed. The size of the sampling error depends upon both the total number of respondents in the survey and the percentage distribution of responses to a particular question. For example, if 50% of respondents in a sample of 304 respondents answered “Yes” to a particular question, we can be 95% confident that the true percentage will fall within 5.6 points, or from 44.4% to 55.6%. The margin of error is higher among subgroups.



2




Summary of Key Findings



3


Connections to Neuroarts

- **Six-in-ten stakeholders believe they are a part of the neuroarts community** at the start of the survey, but intensity is low as only 16% say they are a *big* part of the community. After reading and learning more about the field over the course of the survey, eight-in-ten stakeholders believe they are a part of the neuroarts community and intensity increases to 33% believing they are a *big* part of the community.
 - More than three-quarters of stakeholders across gender, age, race, location, and nature of work say they are a member of the neuroarts community by the end of the survey.
- When reminded that *neuroarts is the study of how aesthetic experience and the arts measurably change the brain and body and how this knowledge is translated into practices that advance health and well-being*, a solid majority of stakeholders (71%) believe the work they do is incorporated into this definition.
 - Older stakeholders are more likely than younger stakeholders to feel like what they do is incorporated into the definition of neuroarts (74% to 66%).
 - White stakeholders are more likely than stakeholders of color to feel like what they do is incorporated into the definition of neuroarts (73% to 63%).
 - Stakeholders who work in policy are less likely than those who work in research, practice, or something else to say the work they do falls into this definition (65% to 74% and 70%, respectively).




5

Knowledge of Neuroarts




- Nearly seven-in-ten stakeholders say they know only some (38%), a little (23%), or nothing at all (9%) about neuroarts and what it includes. **Even among those who self-identify as being a part of the neuroarts community, 57% say they know only some/very little/or nothing at all.**
 - Stakeholders who do not identify as a member of the community (87%), women (73%), stakeholders in the United States (74%), and those who work in practice (73%) are least likely to know a lot about neuroarts.
- **A slim majority of stakeholders (55%) say they sometimes (28%), rarely (19%), or never (8%) work with colleagues who use evidence-based arts interventions or experiences to advance health and well-being.** However, 62% say they collaborate with peers, colleagues, or artists in the neuroarts field.
 - Stakeholders who identify as a member of the community (52%) and those who work in research (50%) are most likely to say they always or often work with colleagues who use evidence-based arts interventions to advance health and well-being.
- A slim majority of stakeholders say current issues, such as the global pandemic and racial justice, have made them more aware of the value of neuroarts – 55% are more aware, 24% are *much* more aware. About four-in-ten (41%) say current issues have not made a difference to their level of awareness.
- **Just as many stakeholder are not sure about the name “neuroarts” as the number of stakeholders who say yes, it is an appropriate name to use** – 44% are not sure and 42% say it is the right name.




4

Connections to Neuroarts Continued




- **A solid majority of stakeholders are interested in engaging in and helping cultivate the field of neuroarts, including 57% who are very interested.** Self-identified members of the community (74%), those who already collaborate with others in the field (69%), those who use music or sound in their work (61%), and older stakeholders are most likely to be *very* interested in engagement.
- Seven-in-ten say they would be more likely to get involved in a community of researchers, practitioners, and other allies who use the arts as a science-based tool to advance health and well-being, including 45% who say they would be much more likely to do this.
 - Those with a degree in visual arts (62%) or health (53%), stakeholders of color (52%), stakeholders who use nature in their work (51%), self-identified members of the neuroarts community (51%), and those who collaborate with others in the field (51%) are most likely to say they would be *much* more likely to get involved in a community that uses the arts as a science-based tool to advance health and well-being.
- With less intensity, 69% of stakeholders say they are likely to engage in neuroarts and help cultivate the field. Older stakeholders (37% of older women and 34% of older stakeholders in general) and those who do not collaborate with peers in the field already (55%) are most likely to say they are not likely to engage.




6

Proper Role for Neuroarts




- More than nine-in-ten stakeholders say **neuroarts can best be used in health and well-being to improve individual well-being**, followed by solid majorities who say it can be best used to engage communities in health practices, improve current health, and promote healthy behaviors and to prevent disease in individuals.
 - *To improve individual well-being* – 92%
 - *To engage communities in healthy practices* – 81%
 - *To improve current health* – 73%
 - *To promote healthy behaviors and to prevent disease in individuals* – 72%
- A majority also say neuroarts can best be used in health and well-being to treat medical conditions or disease symptoms (59%).
- **A solid majority of stakeholders believe neuroarts has or can have a lot of value if integrated into the following fields:** childhood development (86% a lot of value), mental health (86%), education (81%), performing arts (71%), community health (71%), public health (69%), complementary or integrative medicine (69%), physical health (68%), allied health (65%), community development (64%), social work (63%), and civic engagement (58%). Childhood development, mental health, and education are the top fields stakeholders across demographics say will get a lot of value from neuroarts.
- **A plurality of stakeholders (41%) believe the best home or center of gravity for neuroarts as a field would be an interdisciplinary center affiliated with a university or college.** An interdisciplinary center affiliated with a university or college is the top response across demographic subgroups.




7

Benefits to Collaborating in Neuroarts




- **The benefits of collaborating in neuroarts focus on bringing together multiple disciplines, building a community of colleagues and peers who offer diverse skillsets, increasing the available resources, sustained grant funding, breaking down barriers, and solidifying the evidence for neuroarts.**
 - *Bringing together multiple disciplines – from practitioners in the arts and health fields to academics and researchers – for a common goal* – 83% very beneficial, 97% beneficial
 - *Building a community of colleagues and peers who offer diverse skillsets and expertise that you can call on* – 81% very beneficial, 97% beneficial
 - *Increasing the resources that are available for artists and cultural practitioners to promote health and well-being* – 78% very beneficial, 95% beneficial
 - *Ensuring availability of sustained grant funding* – 78% very beneficial, 94% beneficial
 - *Breaking down structural barriers so that science and arts can team up* – 76% very beneficial, 96% beneficial
 - *Solidifying the evidence for neuroarts so that integration of interventions and practices into healthcare becomes commonplace* – 75% very beneficial, 93% beneficial
- In their own words, a plurality of stakeholders say an established field of neuroarts would help their work by bringing validation and increasing acceptance of said work (26%). Stakeholders say the neuroarts field would help their work by creating a community that allows for collaboration (17%), providing opportunities for training and best practices (16%), and increased advocacy (15%) as well.




9

Cultivating the Field




- Several elements are noted as critical for cultivating the field of neuroarts by at least six-in-ten stakeholders, including **collaboration across disciplines** (90%), **funding** (83%), **public awareness** (81%), **common vocabulary/taxonomy** (74%), and **standards of practice** (65%).
 - At least half say recognized leaders or leadership (56%) and a centralized data repository (53%) are critical as well. Collaboration across disciplines, funding, and public awareness rise to the top across demographic groups.
- **Providing opportunities for artists and performers to partner with scientists, researchers, and health professionals is the top-rated offering within the field of neuroarts** – 50% rate it 10 on a 0-10 scale, 78% rate it an 8-10.
 - Offering a clearinghouse of grant and other funding opportunities (65% rate 8-10), a repository of neuroarts research (62%), educational curricula (60%), specialized workshops/webinars (59%), and a central resource for best practices and strategies for building their own neuroarts program (58%) round out the top tier of services and activities.
- Professional development that focuses on attending trainings, workshops, or other learning forums is very important to 54% of stakeholders and is important overall to 85% of stakeholders. Three-quarters of stakeholders say it would be important to be offered mentorship in the field as well.
 - In a middle tier falls the opportunity to contribute to a journal (61% important), certification programs (59%), and degree-granting programs (58%). Stakeholders split toward awards or other professional recognition, with 48% saying it would be important and 48% saying it would not be important.




8

Barriers and Challenges to Collaborating in Neuroarts



- **Funding is the top barrier among stakeholders with experience collaborating with others**, followed by support from public or professional entities and siloed fields. Stakeholders are least likely to see ego, poor communication, lack of leadership, or professional development as barriers.
- **In terms of collaboration, funding resources rise to the top as being very challenging, with 69% saying it is very challenging and 91% saying it is challenging overall.** However, all challenges listed, from organizational capacity to incentives for promotions, are believed to be at least somewhat of a challenge.
 - Across demographics, funding resources, organizational capacity, priorities, and time commitment are most likely to be listed as the top challenges to collaborating in the field. Stakeholders of color and those who identify as members of the neuroarts community are least likely to say diversity is a challenge to collaborating.
- In their own words, a quarter of stakeholders say the absence of sustained funding is the greatest challenge to collaborating in neuroarts. Differences between artists and scientists/researchers/healthcare professionals and the siloed nature of the field resulting in limited communication and collaboration fall into a second tier of challenges.
- **A plurality of stakeholders (43%) say an established field of neuroarts would not impede their work** and another two-in-ten say either the prospect is not applicable, or they are not sure. About one-in-ten share concerns around certifications being required (11%) or the field becoming elitist and siloed (9%).



10

Statements about the Neuroarts Field

- Stakeholders align with the argument that **a more holistic view of what promotes a community's health and well-being should be the foundation of neuroarts** at higher rates than they do an individual's health and well-being when up against the argument that research and practices need to be validated by standardized and rigorous quantitative and qualitative approaches.
- A solid majority of stakeholders (65%) say we should not only concentrate on its role in preventing and treating diseases and other medical conditions, but also *its impact on a person's well-being*.
- Stakeholders respond strongly to each value statement related to the neuroarts field, especially those that focus on arts being fundamental to being human and the need for neuroarts to be accessible to all populations across lifespan and communities.**
 - Making and beholding art is fundamental to being human, a common thread that ties together people across culture, races, ethnicity, income, age, and skill-set is the language of humanity, a tool to elevate disparate voices, and a catalyst of action* – 87% strongly agree, 97% agree
 - The use, application, and benefits of neuroarts must be accessible to all populations across the lifespan and in communities of every stripe* – 81% strongly agree, 93% agree
- Majorities strongly agree that *neuroarts honors the many ways of knowing and informs practices that improve health and well-being and as an interdisciplinary field, neuroarts values art and science equally and uses technology as the mechanism to bring them together*.



11

Statements about Art, Health and Well-being, and Science Continued

- At least seven-in-ten stakeholders strongly agree with value statements about art, health and well-being, and science, particularly statements that speak to the importance of developing evidence, the role neuroarts plays in community-based programs as well as individuals, and how art is at the core of being human.
 - Developing evidence is important when cultivating the field of neuroarts* – 79% strongly agree, 96% agree
 - Neuroarts should have a role to play in community-based programs that are intended to enhance health and well-being* – 78% strongly agree, 94% agree
 - Neuroarts can advance the health and well-being of an individual* – 77% strongly agree, 94% agree
 - Art is at the core of being human* – 76% strongly agree, 93% agree
 - Science provides evidence that art changes the body and brain^* – 76% strongly agree, 91% agree
- Stakeholders who work in research are +13 points more likely to strongly agree that *neuroarts should have a role to play in community-based programs that are intended to enhance health and well-being*. Those who categorize their work as something other than research, practice, or policy are +14 points more likely to strongly agree with the community-based role as well.



^Regression analysis shows this statement is a significant predictor of higher levels of engagement in the neuroarts community

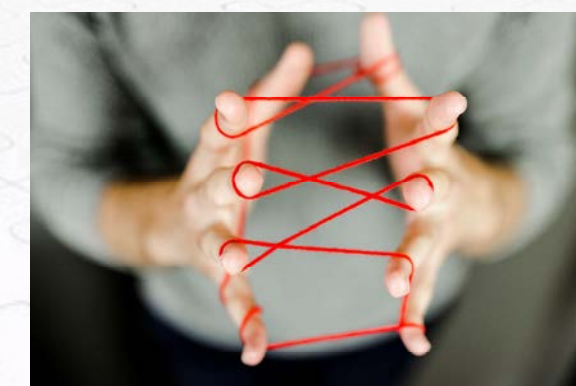
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Statements about Art, Health and Well-being, and Science

- At least eight-in-ten stakeholders strongly agree with value statements about art, health and well-being, and science. **Statements that center the role art can play in health and well-being are especially powerful.**
 - The opportunity to bring art into discussions about health and well-being hasn't been fully realized* – 85% strongly agree, 97% agree
 - Art is a powerful agent of change in health and well-being* – 84% strongly agree, 99% agree
 - Art promotes dialog across communities and disciplines and can bring people together* – 83% strongly agree, 97% agree
 - Neuroarts is interdisciplinary by its very nature* – 83% strongly agree, 92% agree
 - Developing evidence is important when cultivating a field* – 81% strongly agree, 94% agree
 - Arts is a health-building tool of value to everyone – across culture, race and ethnicity, at all ages and regardless of skill level* – 81% strongly agree, 96% agree



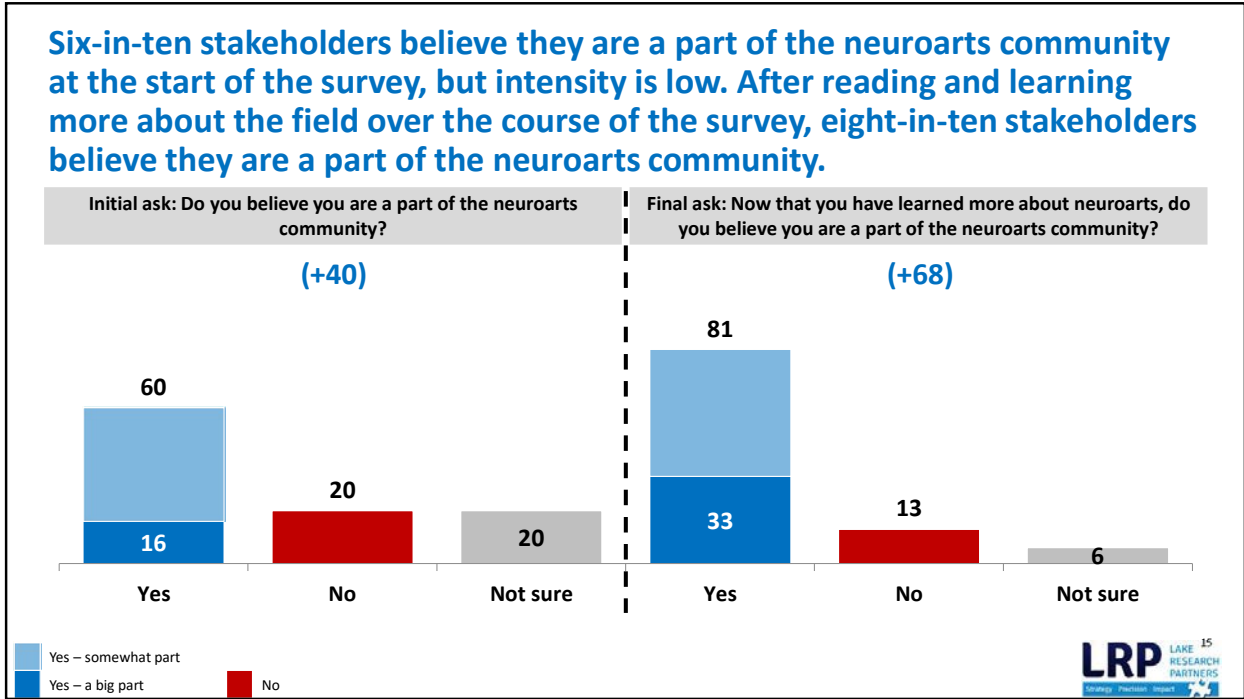
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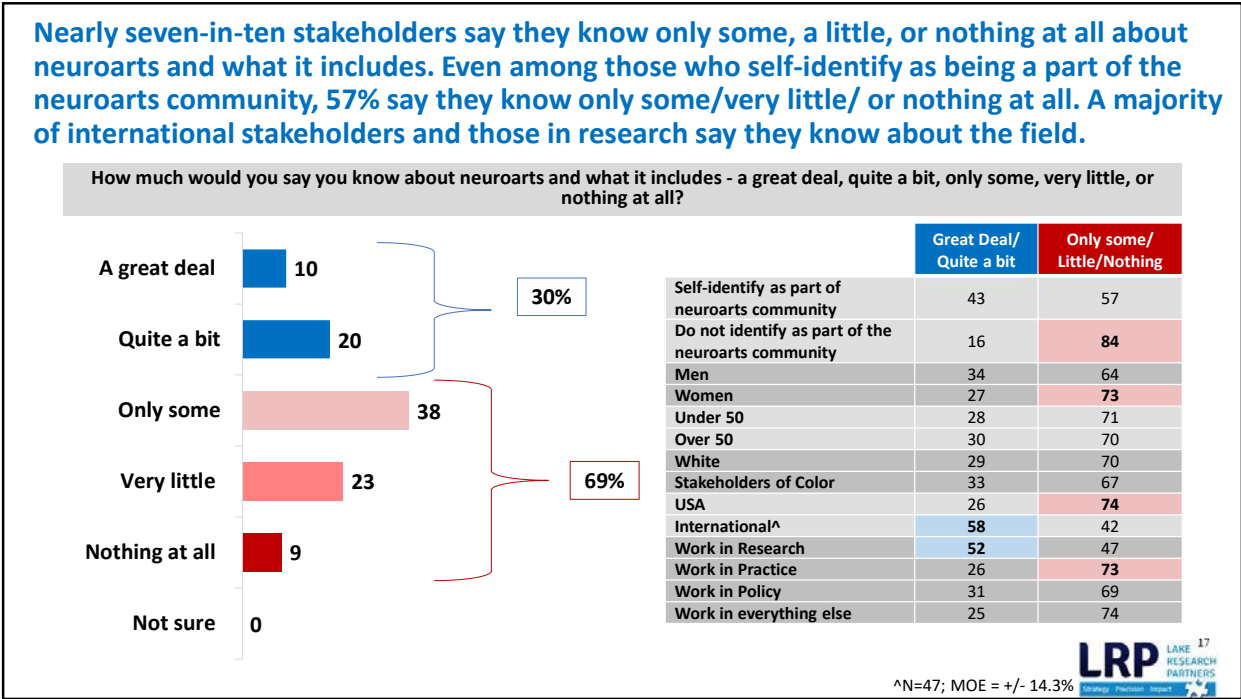
Connections to Neuroarts



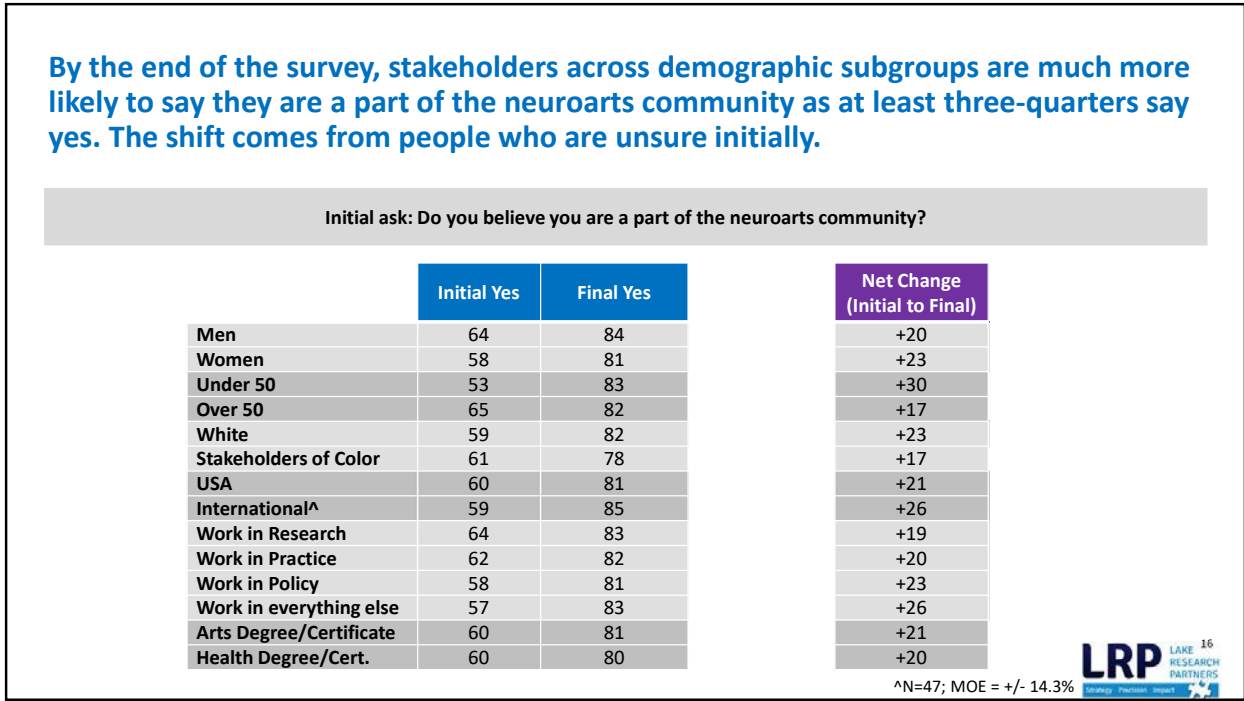
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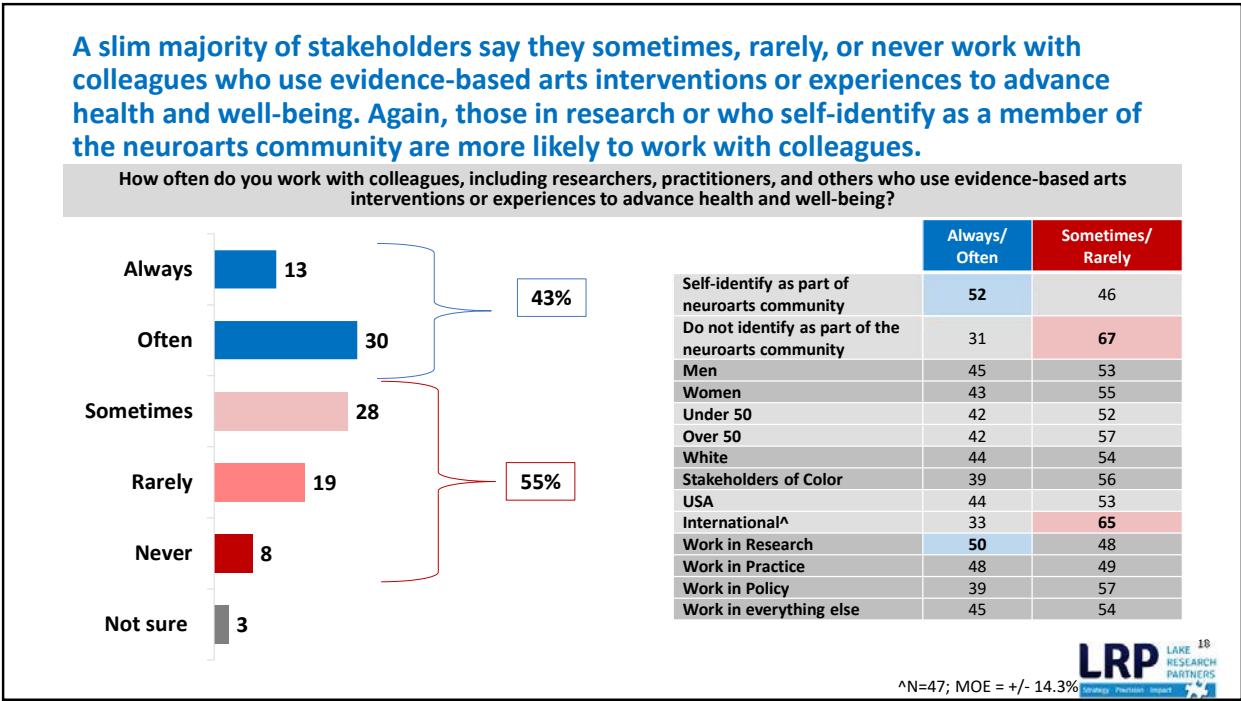
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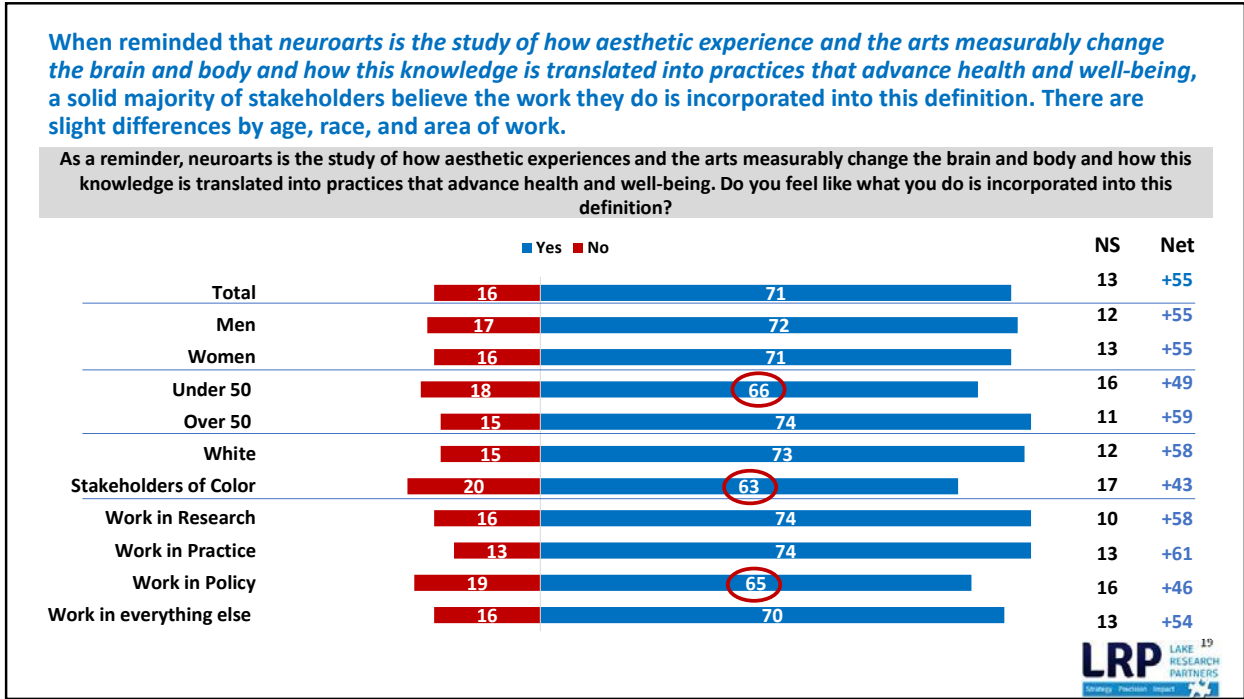
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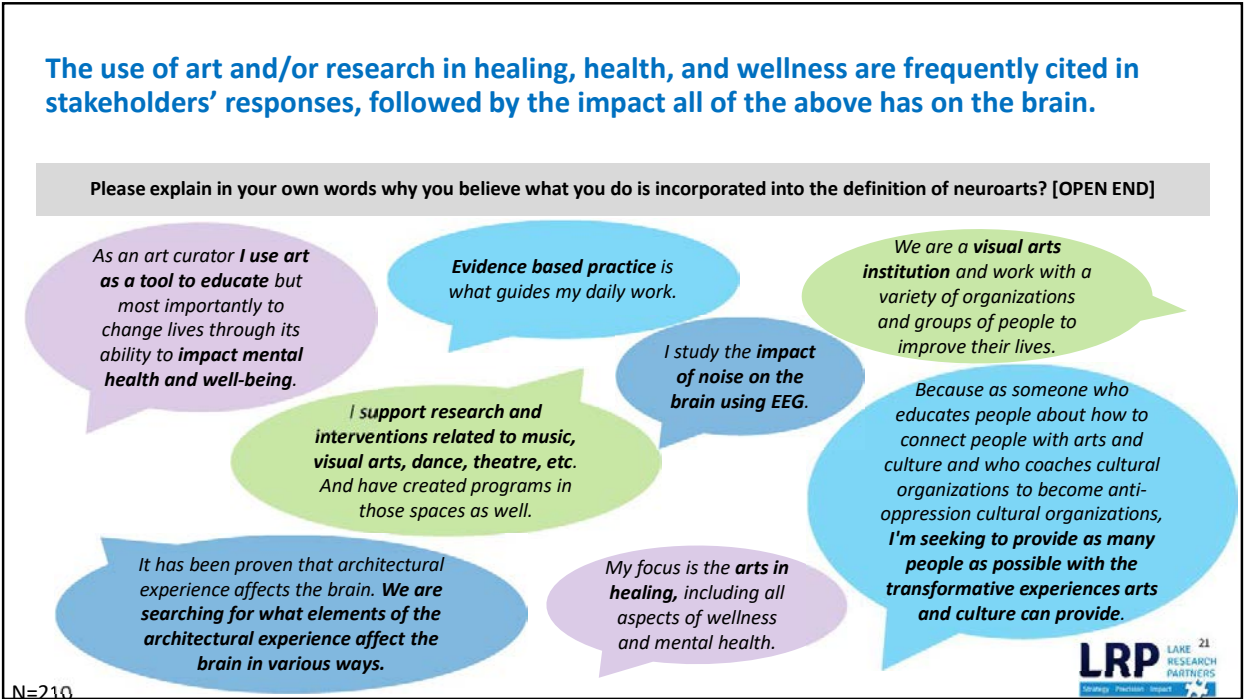
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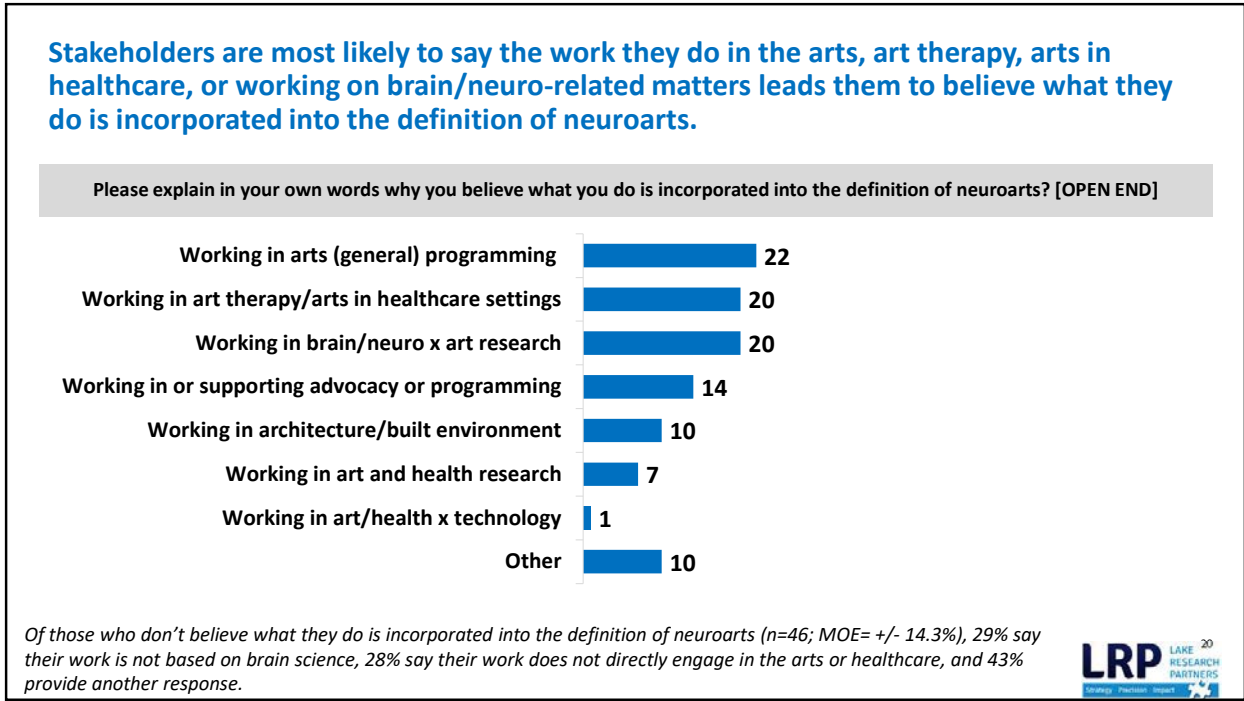
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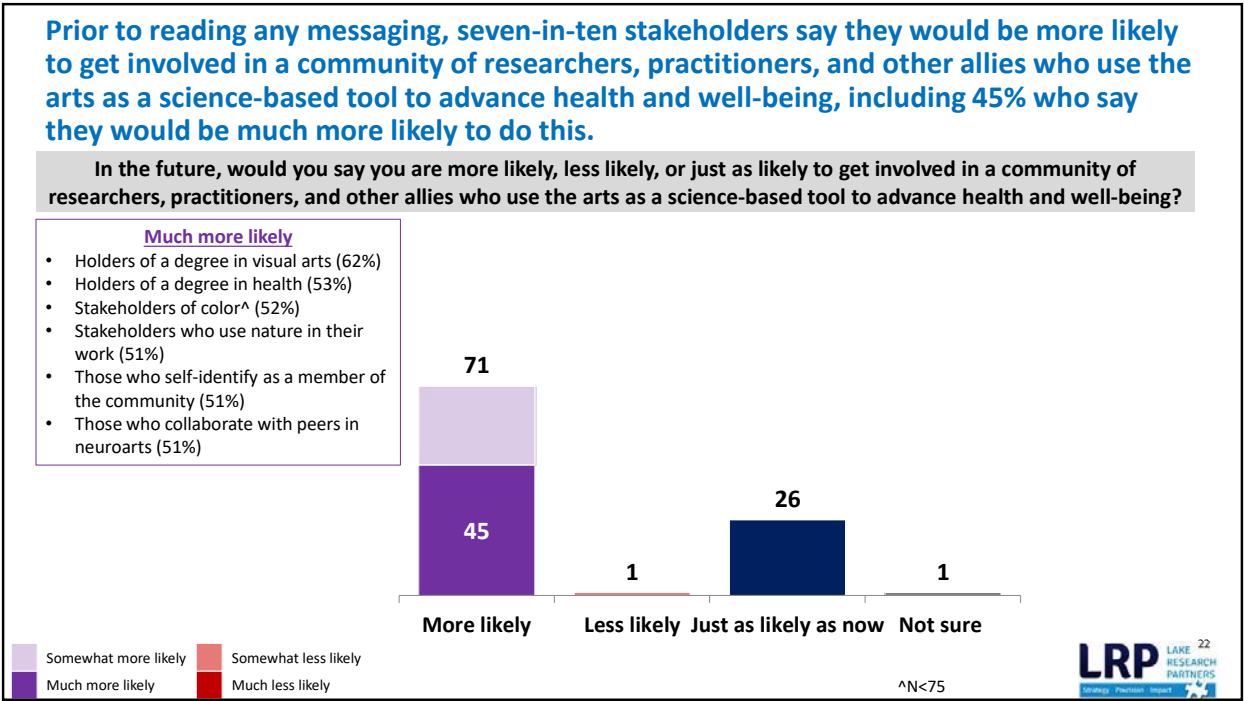
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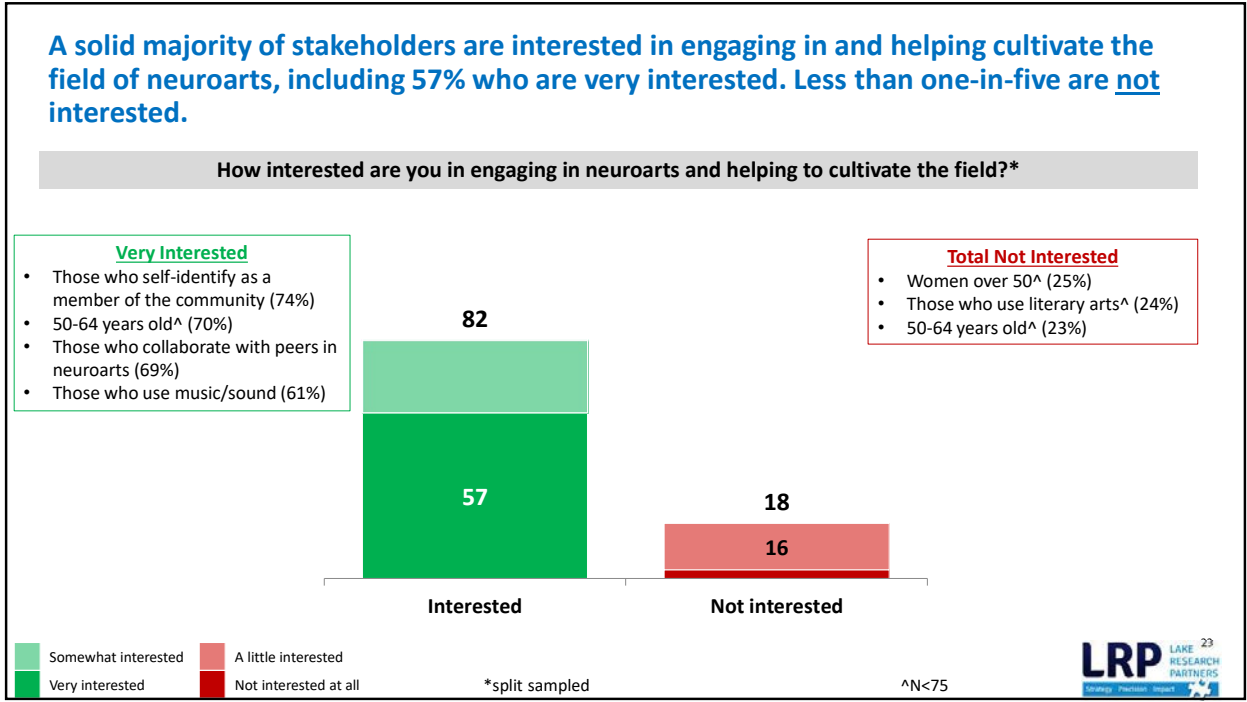
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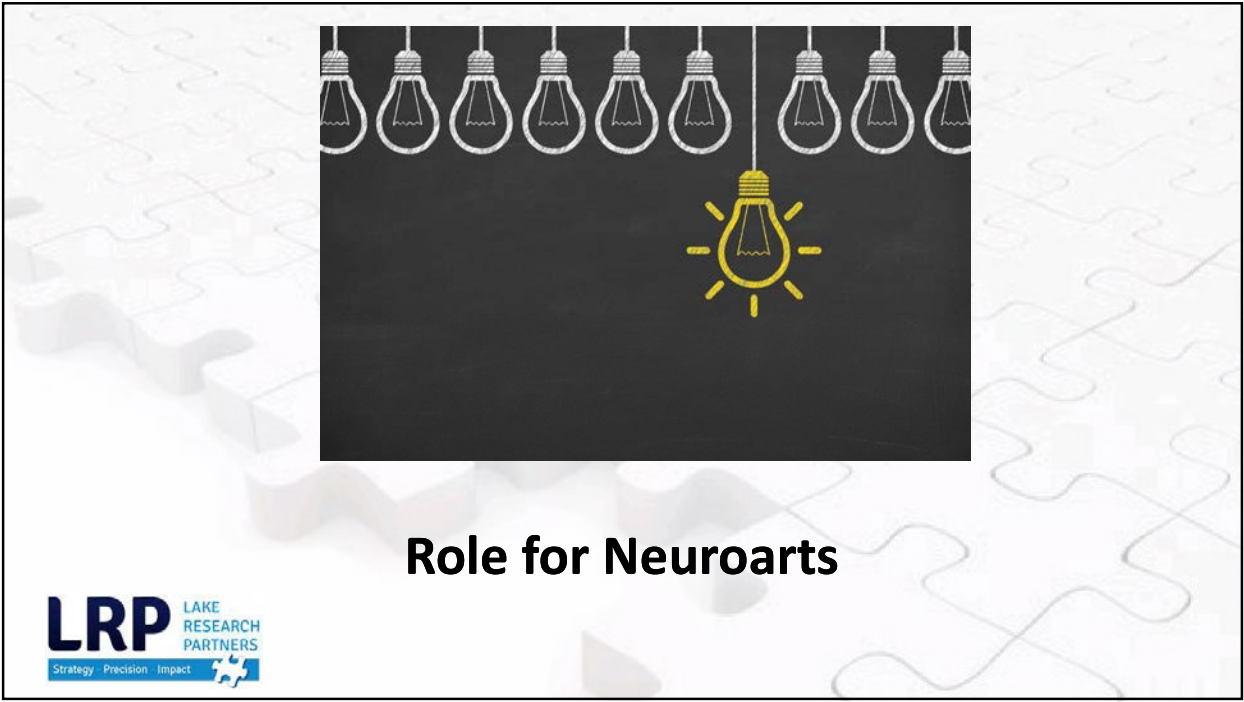
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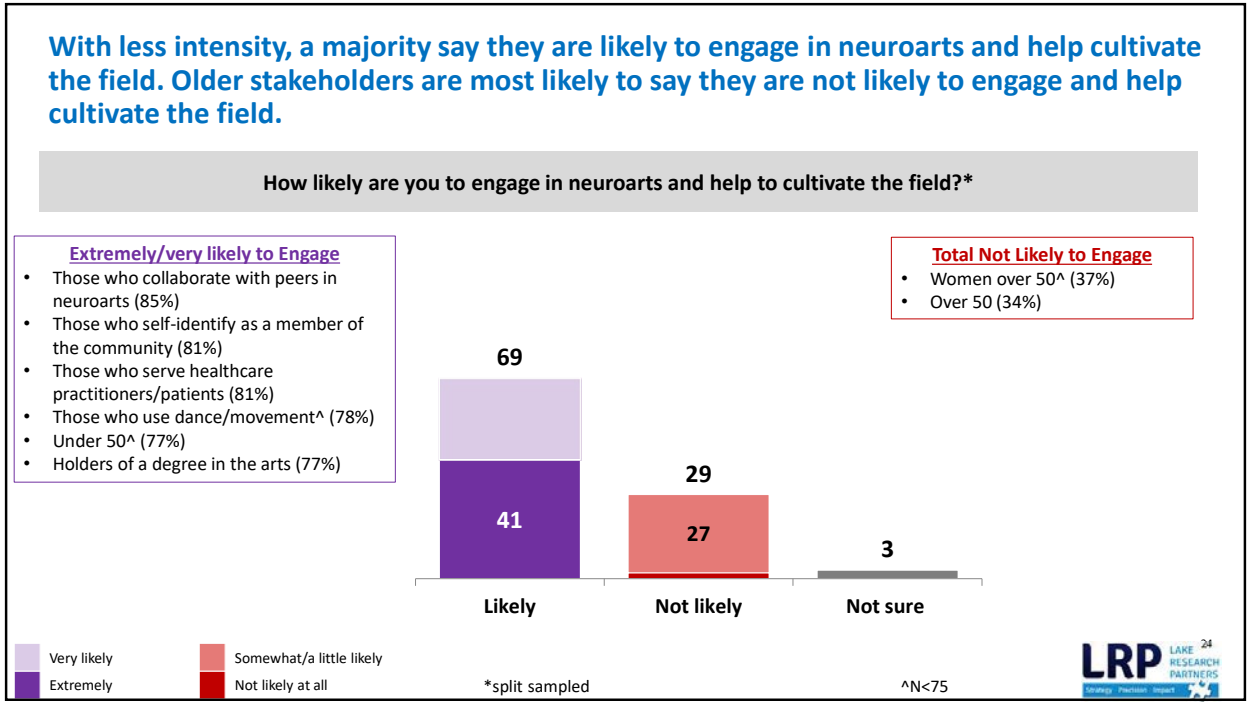
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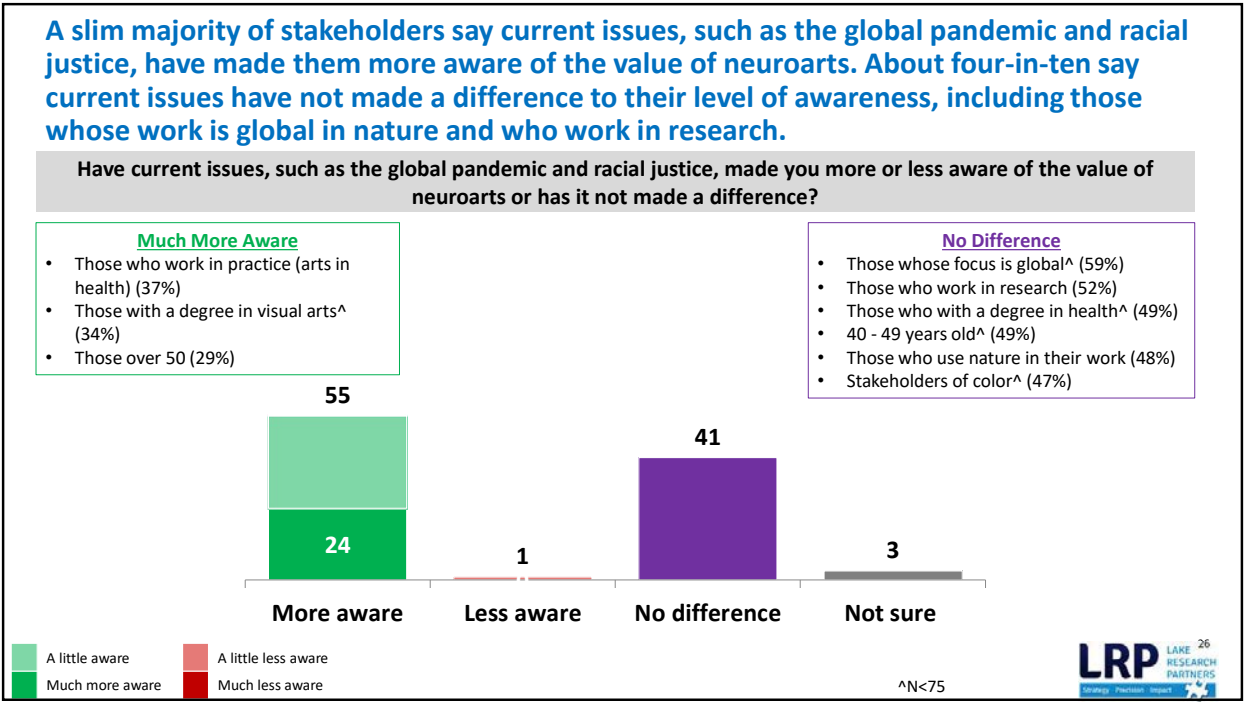
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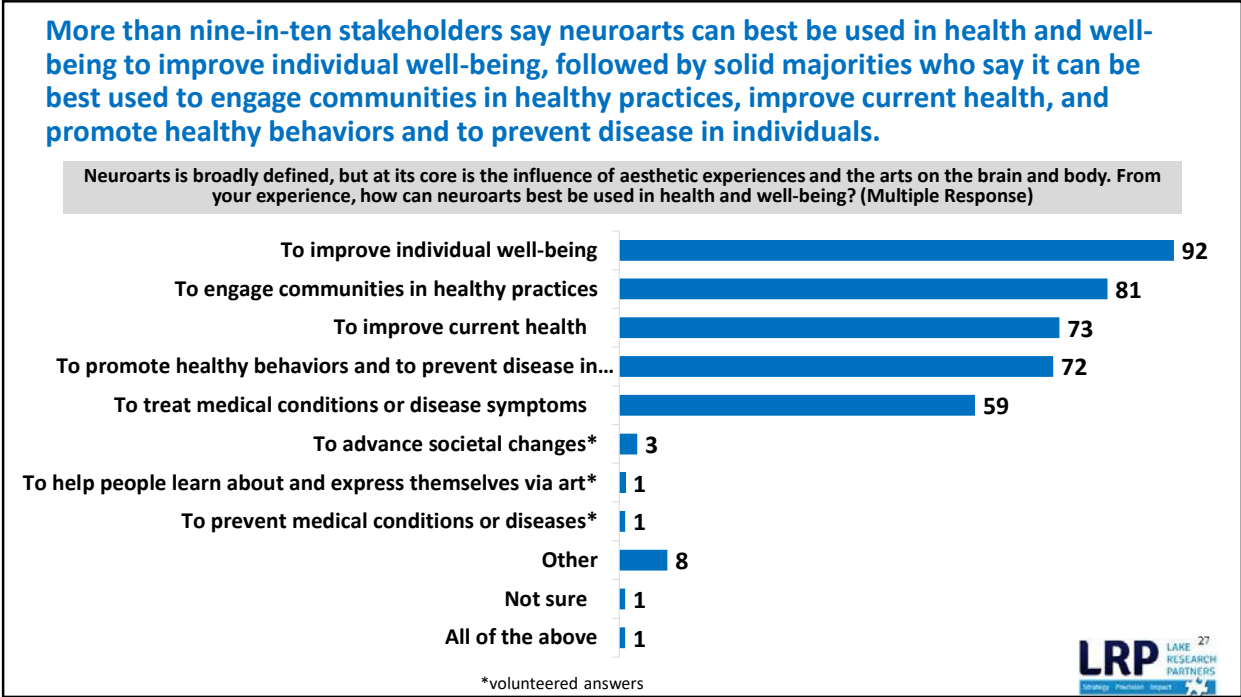
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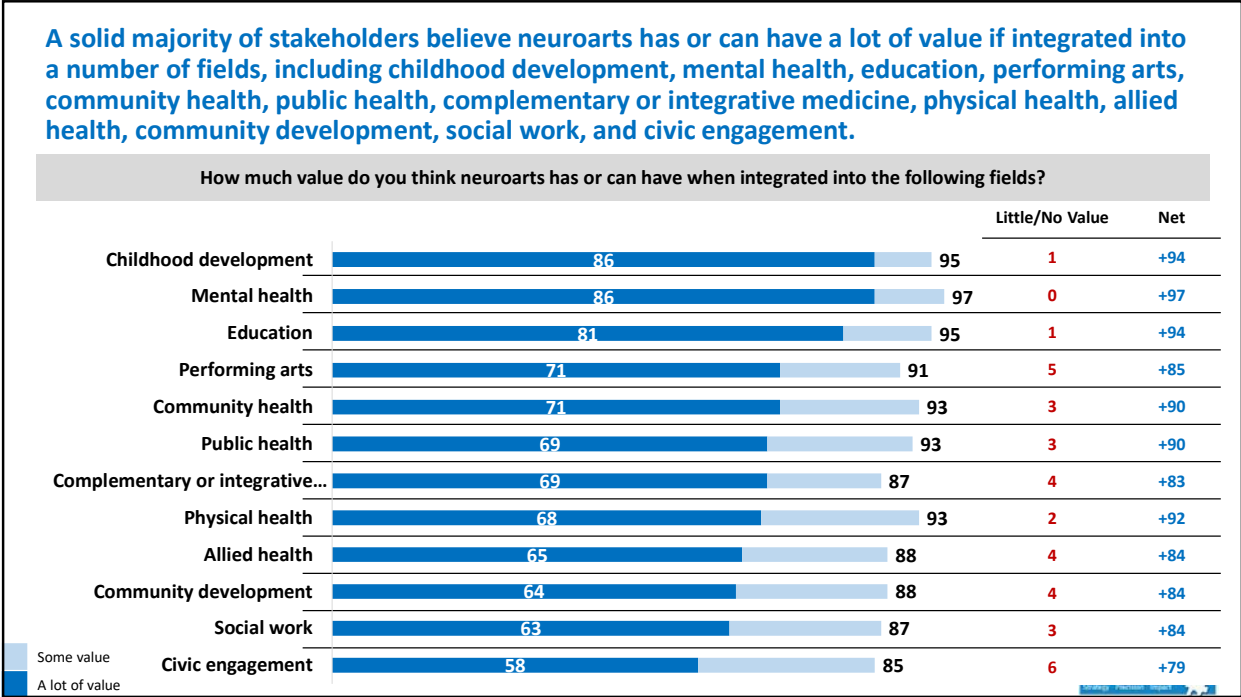
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While the top item across demographics is to improve individual well-being, there are some differences. Female stakeholders are +17 points more likely to cite neuroarts' ability to improve individual well-being and to engage communities in healthy practices than men; stakeholders of color are +8 points more likely to cite neuroarts' ability to improve current health compared to white stakeholders.

Neuroarts is broadly defined, but at its core is the influence of aesthetic experiences and the arts on the brain and body. From your experience, how can neuroarts best be used in health and well-being? (Multiple Response)

	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
		M	W	<50	50+	W	POC ¹	Research	Practice	Policy	Everything Else	Yes	No ²	USA	Outside USA ³
To improve individual well-being	92	80	97	93	93	94	85	91	93	93	93	93	89	92	91
To engage communities in healthy practices	81	75	84	84	81	82	78	78	83	86	87	82	81	81	77
To improve current health	73	68	75	70	75	71	79	68	78	75	79	76	66	76	53
To promote healthy behaviors and to prevent disease in individuals	72	70	73	76	71	70	74	72	72	76	78	75	58	72	68
To treat medical conditions or disease symptoms	59	56	60	61	59	57	64	63	58	61	68	67	46	59	54
To advance societal change*	3	8	2	4	2	2	8	3	4	7	4	2	7	3	2
To help people learn about and express themselves via art*	1	0	2	0	2	1	1	1	1	0	2	1	1	1	0
To prevent medical conditions or diseases*	1	0	1	2	1	1	0	1	0	0	2	1	2	1	2
Other	8	11	5	5	9	8	6	14	7	12	8	10	5	8	8

*volunteered answers

¹N=47; MOE = +/- 14.3%
²N<75

28

Childhood development, mental health, and education are the top fields stakeholders across demographics say will get a lot of value from neuroarts. Women, members of the neuroarts community, and stakeholders based in the United States are slightly more likely than their counterparts to place a lot of value on the role neuroarts can play when integrated into the different fields. Stakeholders of color are 8 to 13 points more likely than white stakeholders to place a lot of value on community development, social work, and civic engagement.

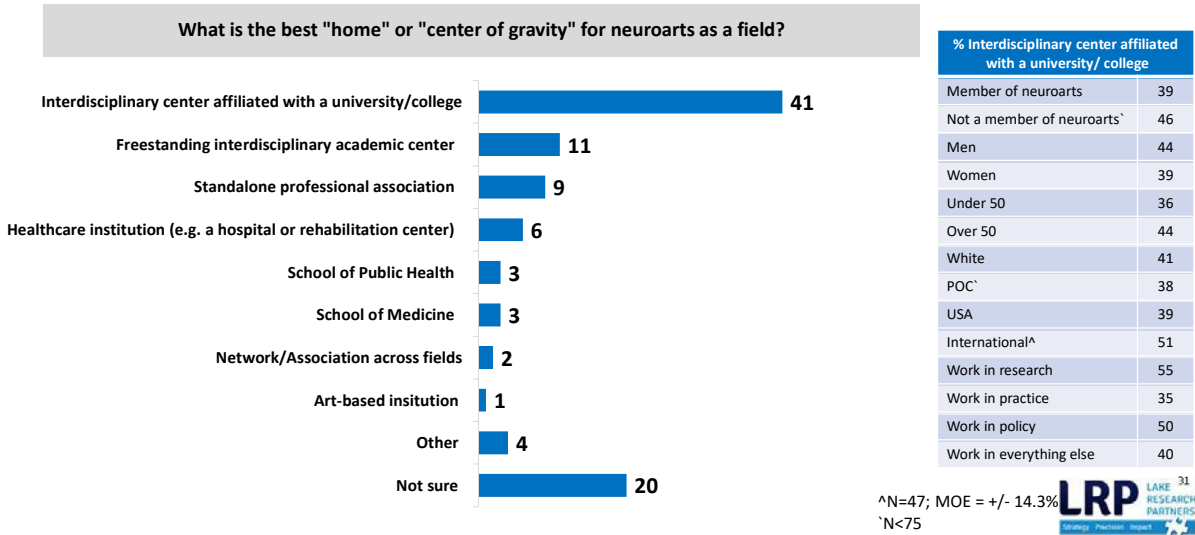
How much value do you think neuroarts has or can have when integrated into the following fields?

	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
% A lot of value		M	W	<50	50+	W	POC ¹	Research	Practice	Policy	Everything Else	Yes	No ²	USA	Outside USA ³
Childhood development	86	79	88	81	89	85	89	78	88	86	85	88	87	88	75
Mental health	86	73	89	87	86	85	87	76	90	89	89	90	81	87	77
Education	81	73	84	84	79	80	82	74	84	81	84	85	73	84	66
Performing arts	71	65	74	70	72	72	68	58	77	67	75	76	63	74	55
Community health	71	59	75	67	73	69	73	61	73	72	75	71	67	73	61
Public health	69	65	71	65	73	68	71	63	71	69	74	74	62	71	56
Complementary/integrative medicine	69	62	71	63	74	71	59	61	71	65	75	76	55	72	50
Physical health	68	58	72	66	71	68	67	61	73	70	70	70	67	71	53
Allied health	65	59	66	62	66	65	62	57	68	74	73	70	54	67	53
Community development	64	62	66	59	68	61	71	53	66	62	69	68	58	64	58
Social work	63	53	67	62	64	60	68	49	68	57	66	67	60	66	42
Civic engagement	58	50	61	50	63	54	67	49	58	57	64	65	46	60	39

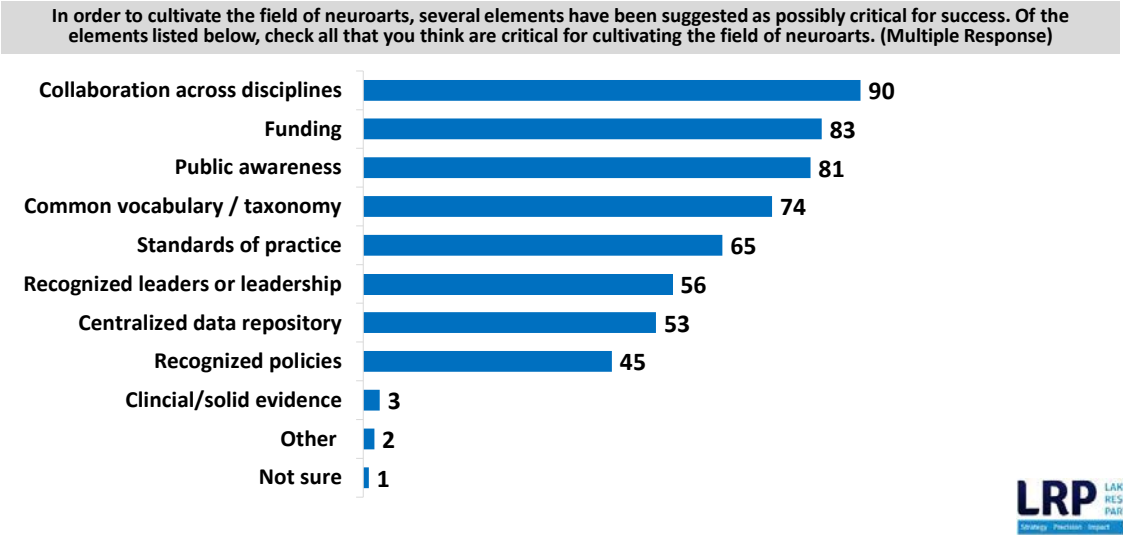
¹N=47; MOE = +/- 14.3%
²N<75

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A plurality of stakeholders believe the best home or center of gravity for neuroarts as a field would be an interdisciplinary center affiliated with a university or college.



Several elements are noted as critical for cultivating the field of neuroarts by at least six-in-ten stakeholders, including collaboration across disciplines, funding, public awareness, common vocabulary/taxonomy, and standards of practice. At least half say recognized leaders or leadership and a centralized data repository are critical as well.



Cultivating the Field



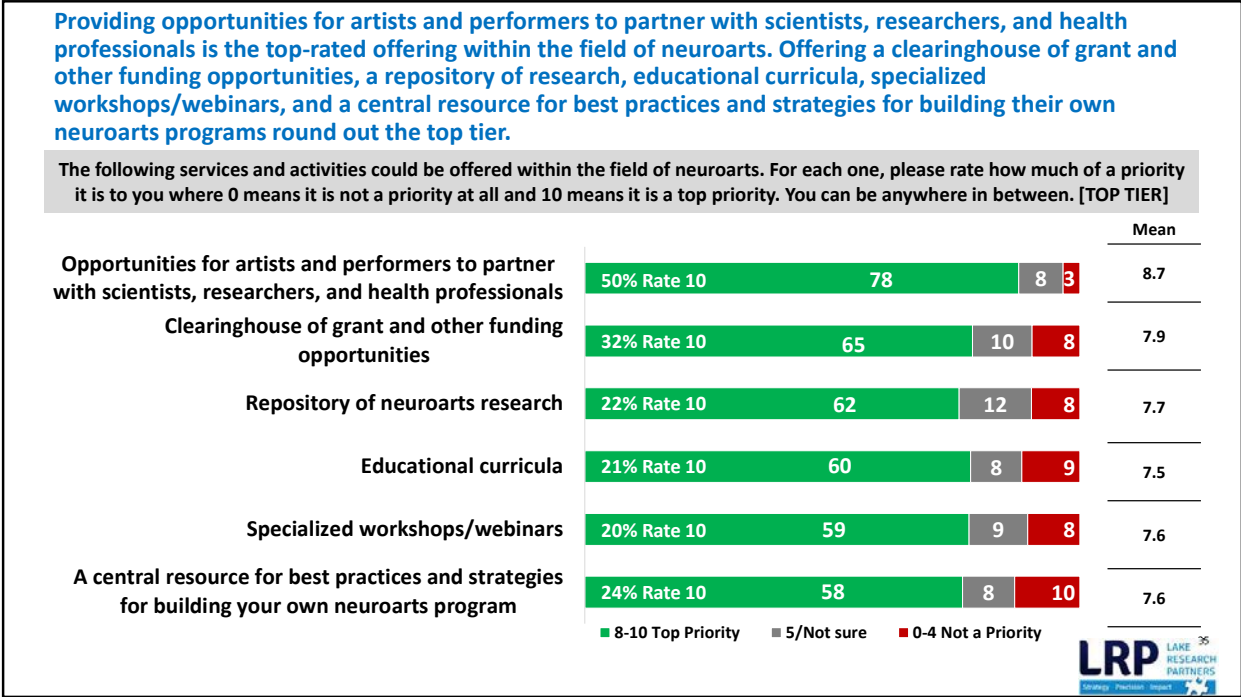
Collaboration across disciplines, funding, and public awareness rise to the top across demographics, followed by common vocabulary or taxonomy. Older stakeholders tend to place more emphasis on common vocabulary, recognized leaders, and a centralized data repository than younger stakeholders; white stakeholders tend to place more emphasis on common vocabulary and standards of practice while stakeholders of color place more emphasis on recognized leaders; those in the United States place more emphasis on public awareness, common vocabulary, centralized data repository, and recognized policies.

In order to cultivate the field of neuroarts, several elements have been suggested as possibly critical for success. Of the elements listed below, check all that you think are critical for cultivating the field of neuroarts? (Multiple Response)

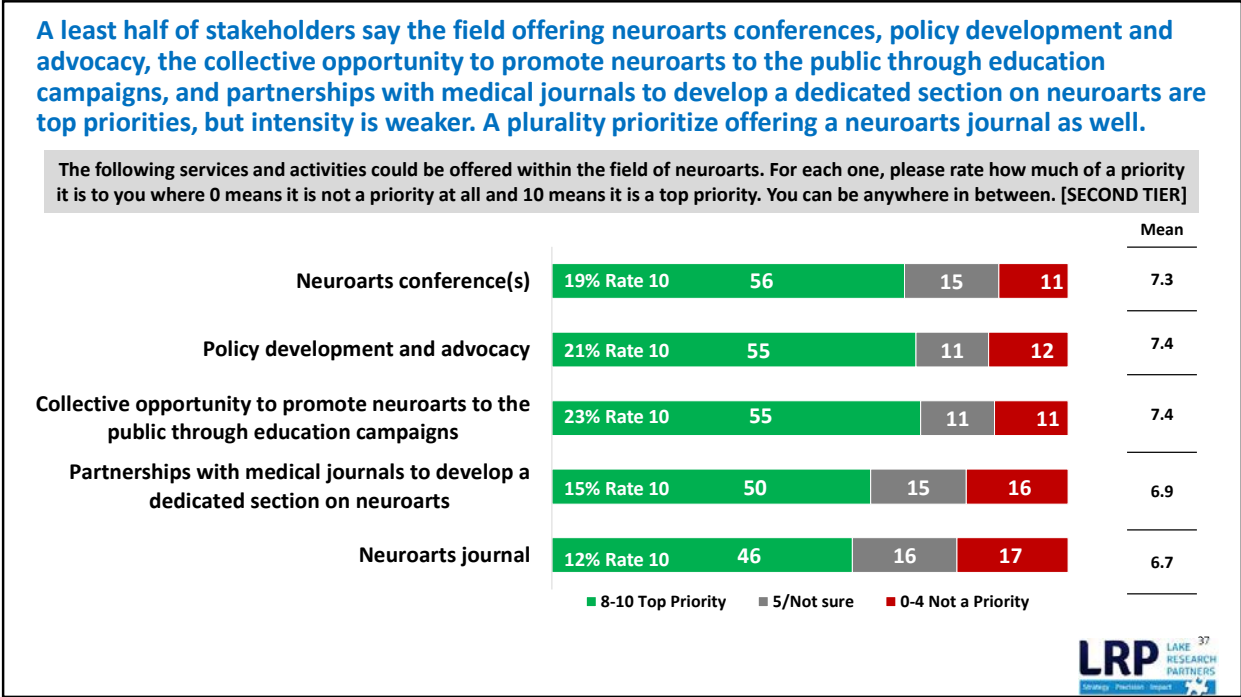
	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
		M	W	<50	50+	W	POC`	Research	Practice	Policy`	Everything Else	Yes	No`	USA	Outside USA^
Collaboration across disciplines	90	90	89	87	92	89	91	87	89	92	90	88	93	90	87
Funding	83	82	83	85	82	82	85	77	79	79	83	84	81	82	86
Public awareness	81	79	83	78	84	80	85	71	84	89	81	83	85	83	66
Common vocabulary/taxonomy	74	65	77	67	79	76	67	71	77	73	73	79	58	76	58
Standards of practice	65	58	67	63	66	66	55	53	67	62	58	66	65	66	54
Recognized leaders or leadership	56	61	55	51	60	54	64	51	53	69	57	54	66	57	49
Centralized data repository	53	54	54	49	57	53	54	40	55	54	57	56	42	56	35
Recognized policies	45	43	46	45	45	44	48	31	47	50	50	45	40	48	22
Clinical / solid evidence	3	7	2	2	4	3	4	6	3	4	3	2	5	3	5
Other	2	2	1	3	1	1	5	3	2	2	2	2	4	2	2

^N=47; MOE = +/- 14.3%
`N<75

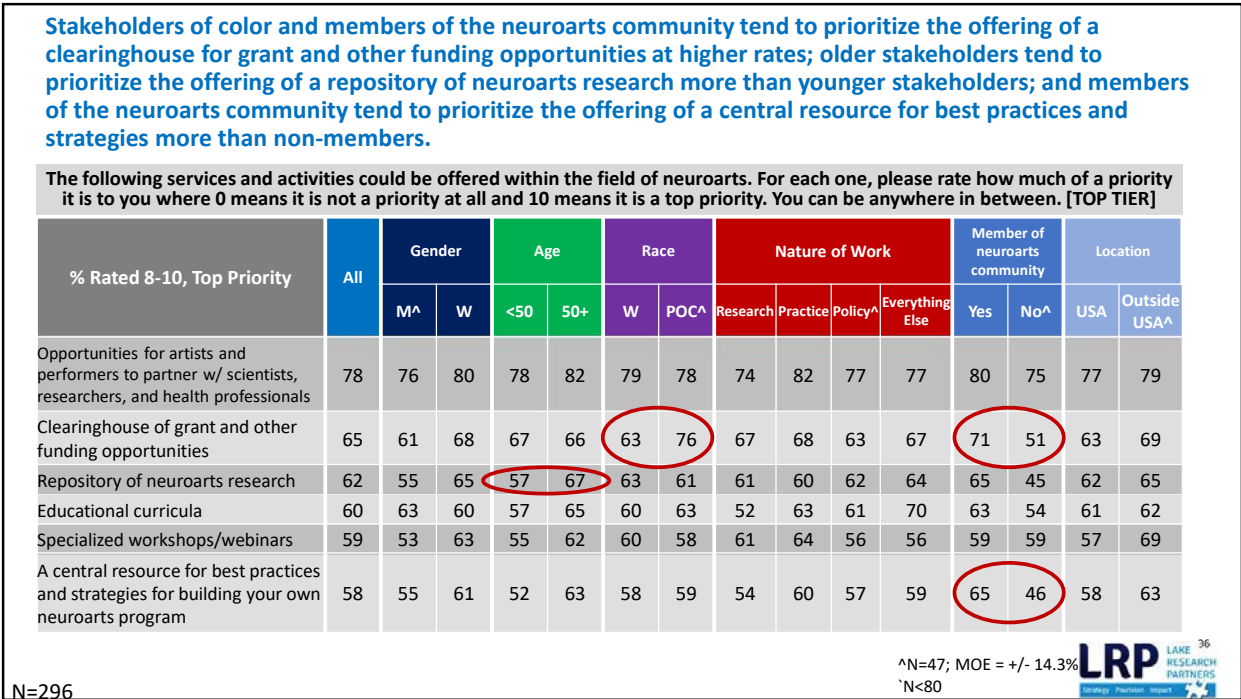
LRP LAKE RESEARCH PARTNERS



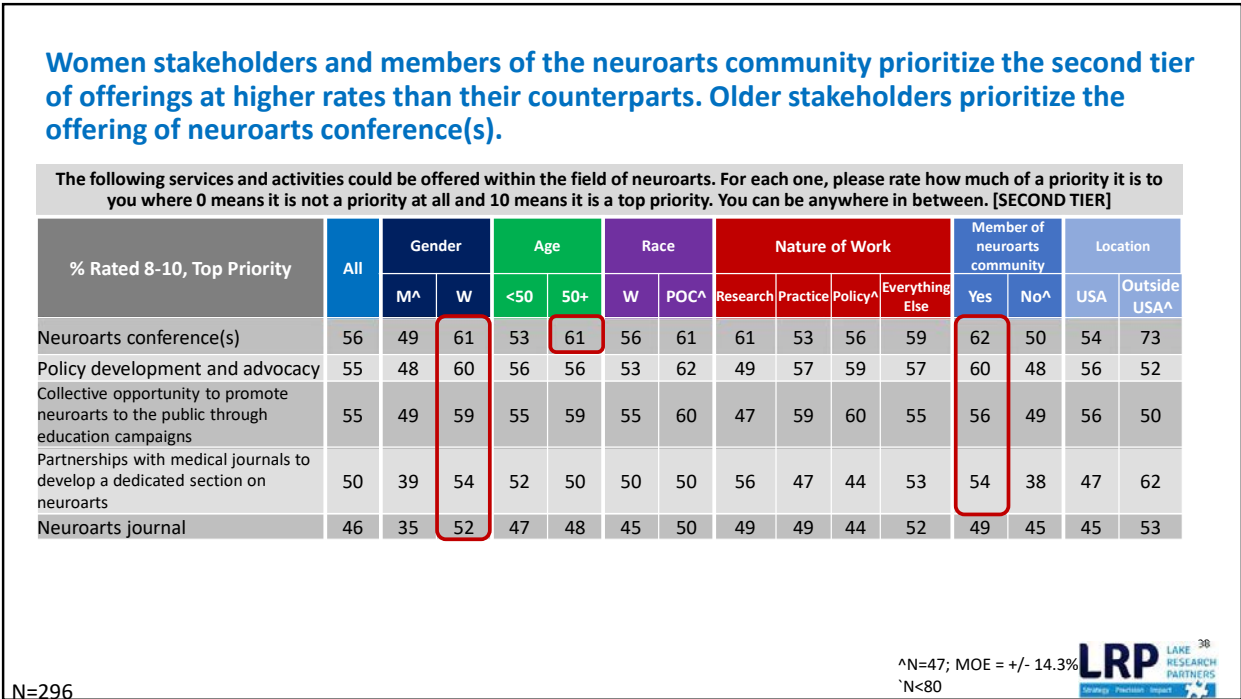
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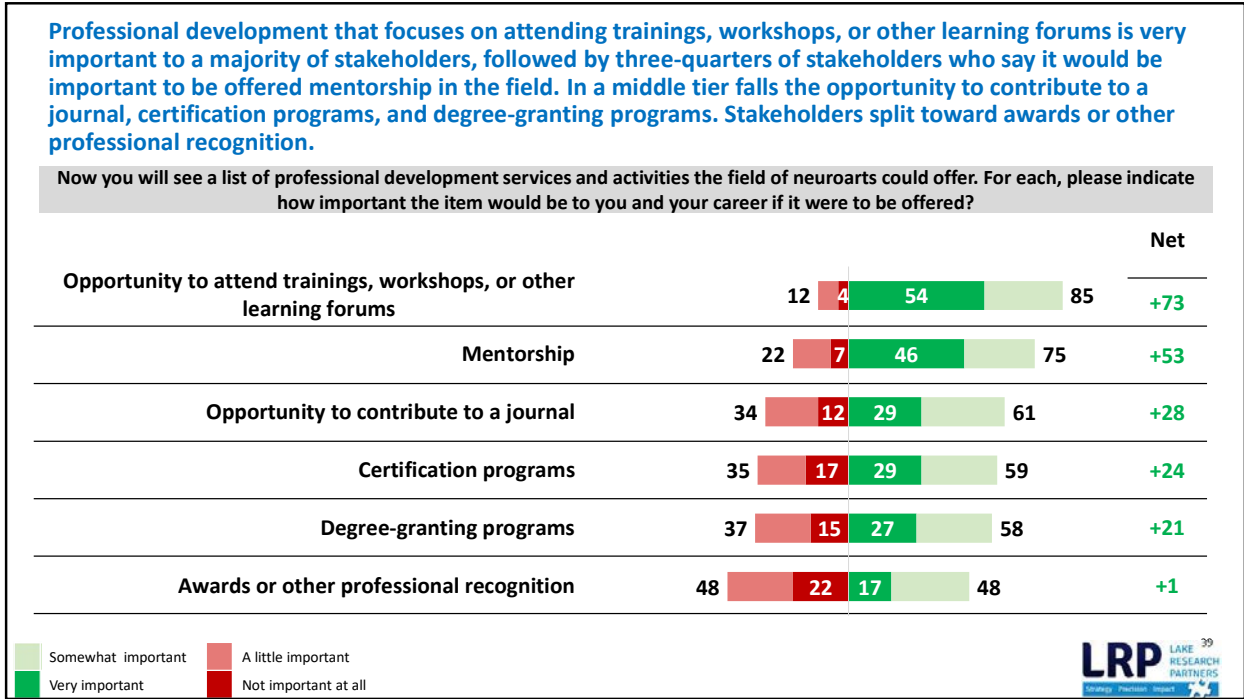
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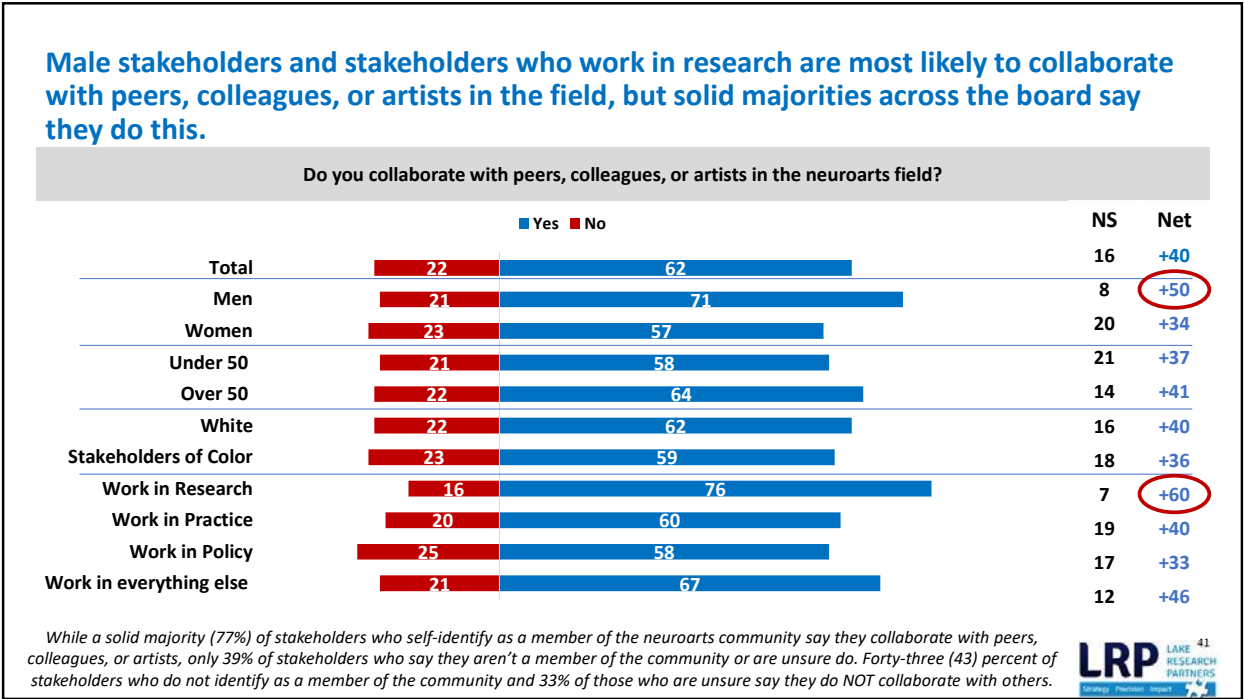
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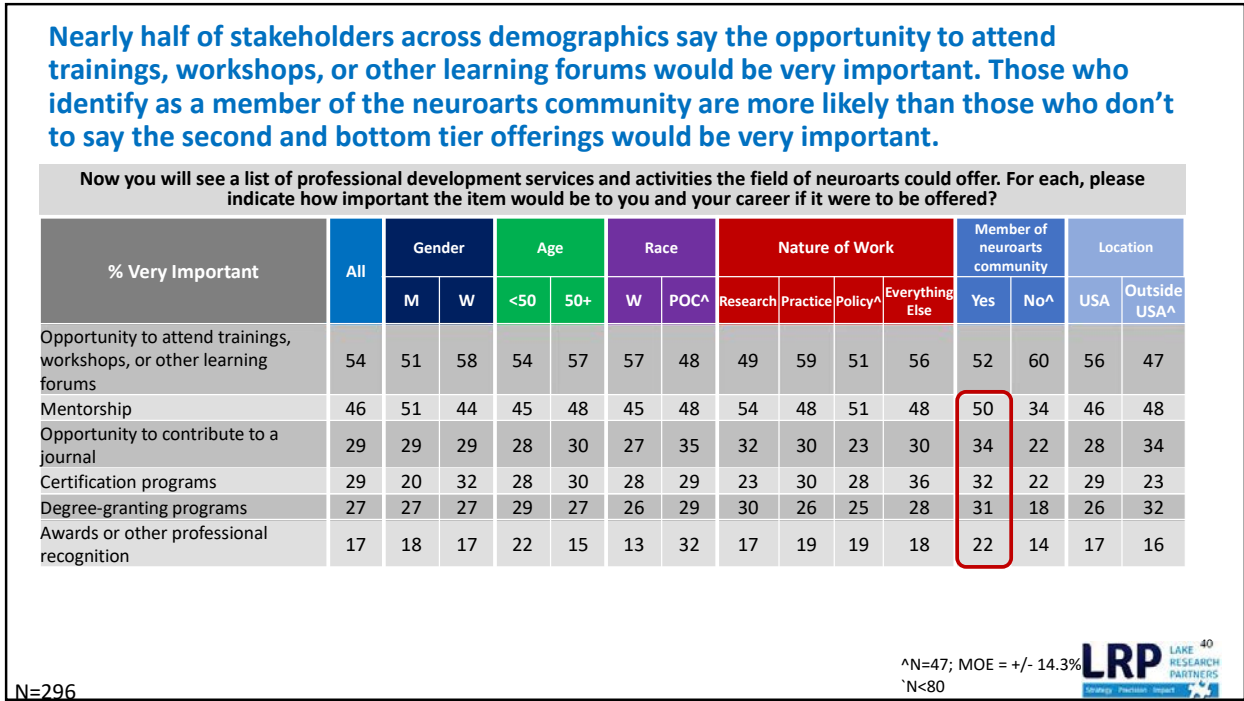
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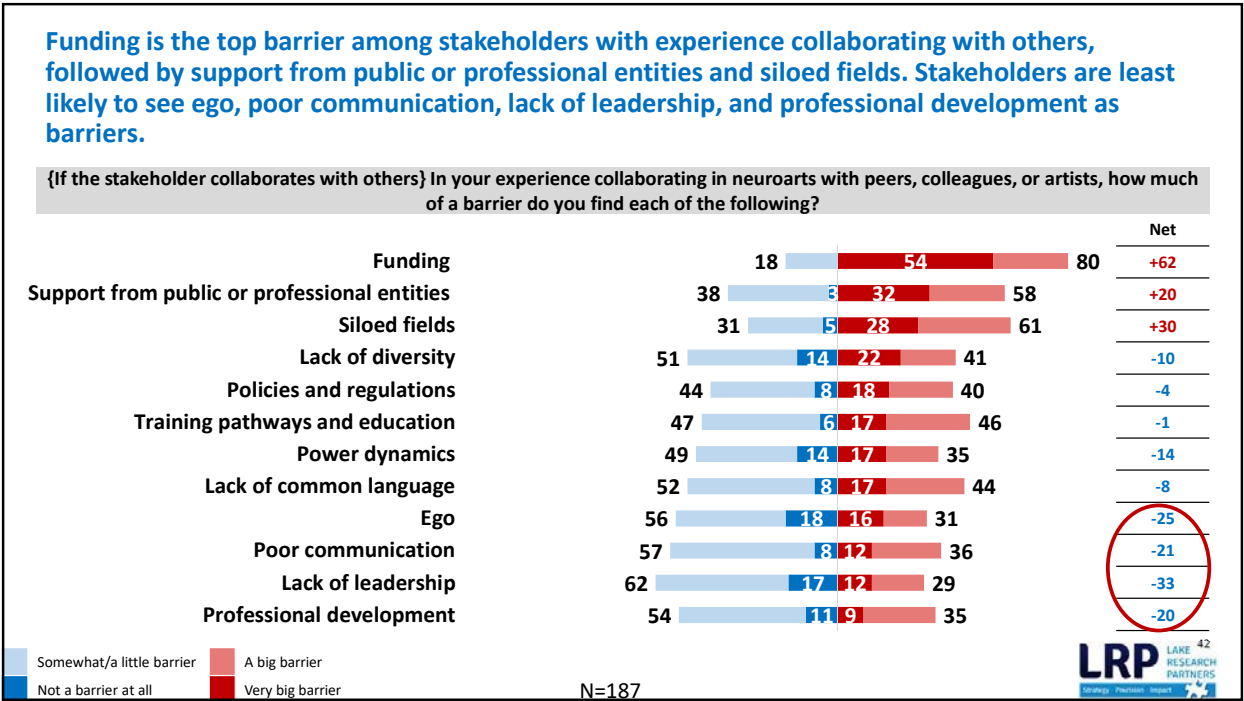
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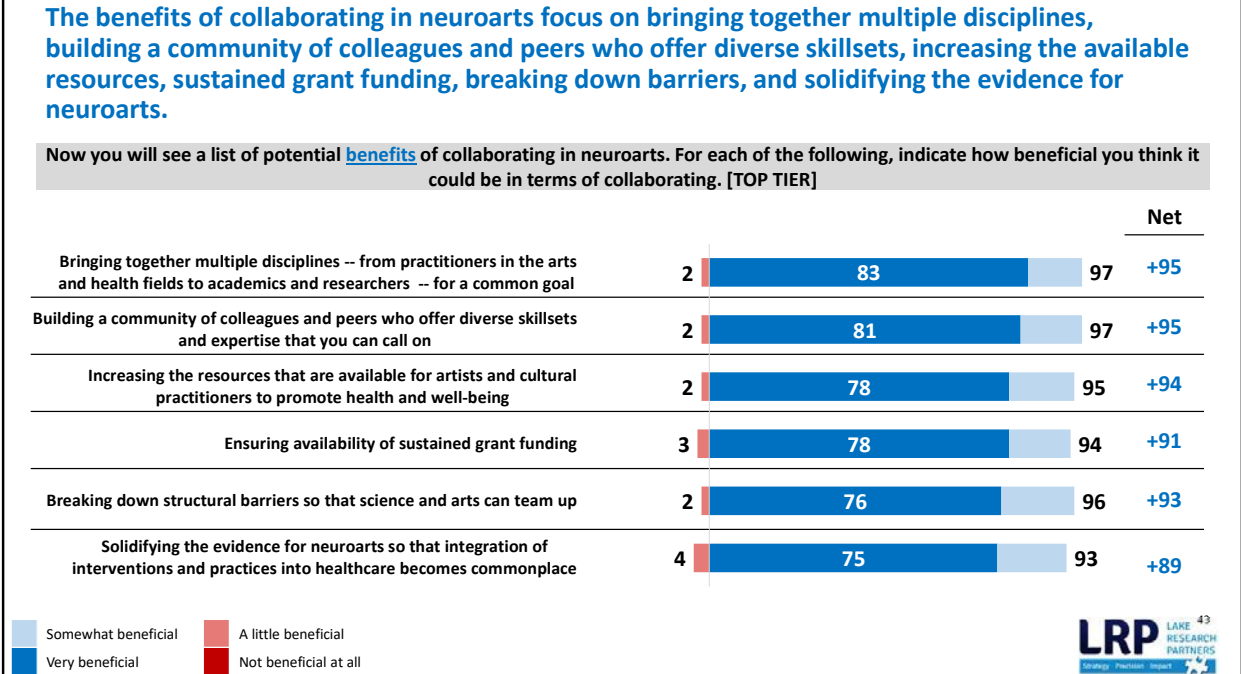
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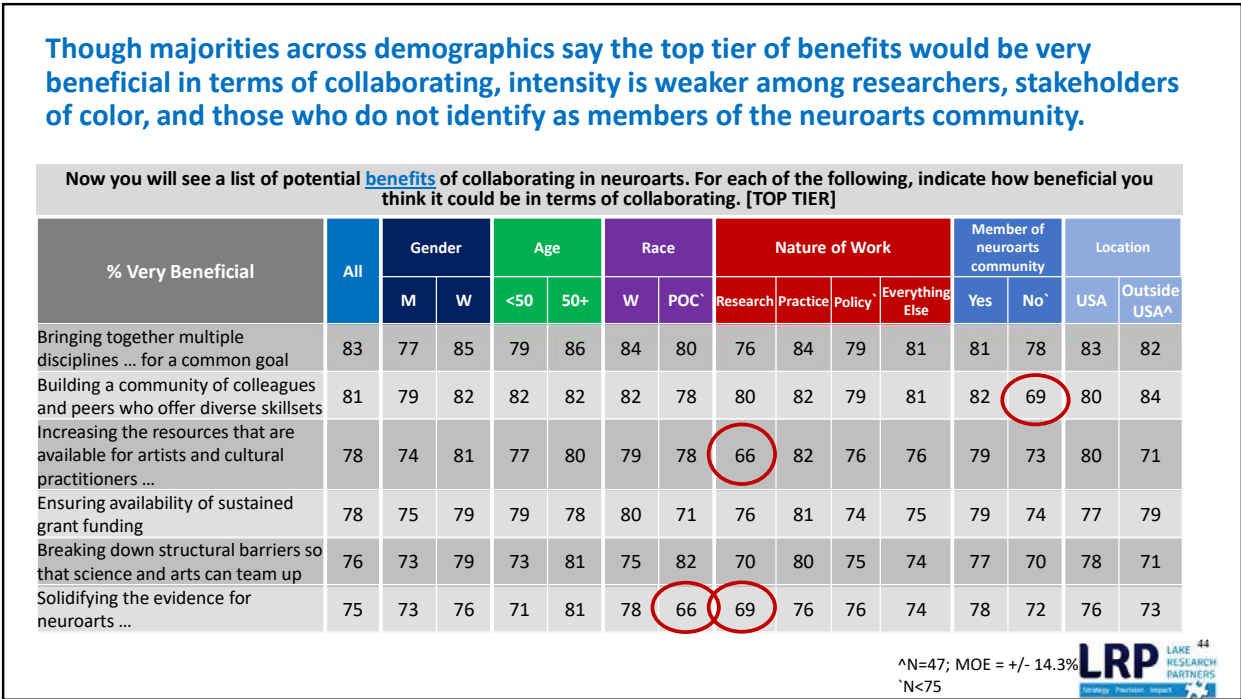
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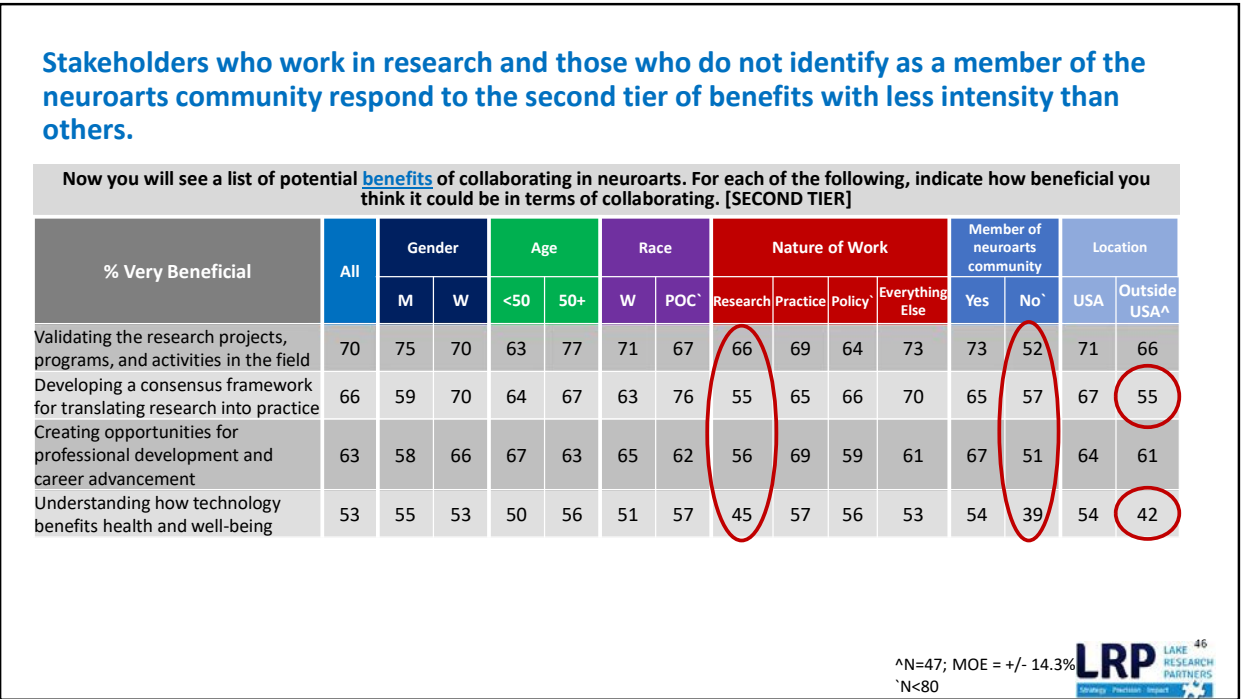
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Now you will see a list of **challenges** to collaborating in neuroarts. For each of the following, indicate how challenging you think it could be in terms of collaborating?

					Net
Funding resources	6		69	91	+85
Organizational capacity and ability to scale programs	11	2	37	83	+72
Time commitment	18	5	35	77	+58
Priorities	13	2	34	82	+69
Disciplinary cultures	19	3	31	78	+59
Current standards of the many disciplines involved	20	4	28	70	+50
Diversity	28	8	24	63	+35
Work style and methodological approaches	24	3	24	69	+45
Language barriers	30	5	20	65	+35
Incentives for promotions	26	7	17	51	+25


■ A little challenging
 ■ Somewhat challenging
 ■ Not challenging at all
 ■ Very challenging


 47

48

Net Challenging – Not Challenging	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
		M	W	<50	50+	W	POC ^c	Research	Practice	Policy ^d	Everything Else	Yes	No ^e	USA	Outside USA ^f
Funding resources	+85	+80	+88	+81	+90	+85	+87	+83	+84	+91	+88	+87	+80	+86	+82
Organizational capacity and ability to scale programs	+72	+73	+73	+73	+74	+73	+73	+70	+68	+82	+73	+72	+72	+73	+70
Time commitment	+58	+66	+57	+52	+64	+61	+54	+66	+57	+68	+61	+60	+59	+60	+50
Priorities	+69	+66	+71	+73	+67	+67	+77	+72	+65	+75	+69	+68	+80	+71	+60
Disciplinary cultures	+59	+74	+55	+59	+62	+58	+72	+64	+54	+64	+58	+55	+70	+63	+46
Current standards of the many disciplines involved	+50	+48	+49	+52	+49	+48	+56	+54	+44	+51	+47	+51	+46	+51	+43
Diversity	+35	+38	+36	+39	+34	+39	+24	+30	+34	+49	+47	+27	+46	+40	+10
Work style and methodological approaches	+45	+47	+44	+55	+42	+45	+47	+46	+46	+43	+38	+44	+56	+43	+57
Language barriers	+35	+43	+31	+38	+34	+37	+34	+27	+30	+30	+32	+31	+39	+38	+22
Incentives for promotions	+25	+22	+30	+25	+30	+27	+28	+28	+23	+36	+21	+30	+21	+26	+20

^aN=47; MOE = +/- 14.3%
^bN<80


 LAKE RESEARCH PARTNER

NEUROARTS BLUEPRINT APPENDIX | ONLINE STAKEHOLDER SURVEY

In your own words, what do you think is the greatest challenge (or challenges) in collaborating in neuroarts? Please explain why you think that is the greatest challenge? [OPEN END]

A horizontal bar chart with blue bars representing the frequency of responses for various challenges. The challenges are listed on the y-axis, and the count for each is shown as a number at the end of the bar. The challenges are ranked from highest to lowest count.

Challenge	Count
Absence of sustained funding	25
Differences between art practitioners and researchers/scientists/HCPs	18
Limited communication/ability to find collaborators because of siloes	18
Competing responsibilities or lack of time	15
Lack of centralized network and common language	15
Nebulousness of the field and limited evidence	14
Hierarchical nature of field and elitism	8
De-prioritization of arts and culture/lack of funding for arts	3
Other	4
Not sure	5

50

In your own words, what do you think is the greatest challenge (or challenges) in collaborating in neuroarts? Please explain why you think that is the greatest challenge? [OPEN END]		
Absence of sustained funding (25%)	Differences between art practitioners and researchers/scientists/HCPs (18%)	Limited communication or ability to find collaborators due to silo-ing (18%)
<ul style="list-style-type: none"> Ensuring availability to sustained grant funding and bringing together multiple disciplines. The greatest challenge is getting the opportunity and the funding to provide neuroarts to people. Receiving funding as an integral part of built environment projects and not as an afterthought. The lack of funding is the greatest challenge because without it we cannot get the evidence we need to refine or validate interventions. The lack of funding and policy direction, which, if reversed, could provide more impetus for research and development of Neuroarts and further promotion of the benefits of the field. Gaining sustained funding that enables long-term meaningful collaboration, rather than short-term superficial projects that are difficult to scale-up / generalize / apply. 	<ul style="list-style-type: none"> The different approaches to committee work taken by those involved in the arts in comparison to those in science or technology. There is often a disconnect between art and health sector, with clinical and biomedical interventions with proven scientific approaches gaining favor over community based, arts or social science approaches. It will require a shift in the public health/clinical field to be open to broader notions of well-being and creative approaches to address health issues. Further, there are funding challenges and a tendency to support biomedical driven approaches and silo-ed vertical approaches to health... Being able to be heard by academia/research communities that are hung up on science-only. 	<ul style="list-style-type: none"> We tend to work in silos and rather than have any one discipline own the arts on a clinical team or at an institutional level we need to integrate and support evidence-based approaches across multiple disciplines and the corporate culture. Openness to collaboration as opposed to territorialism. Identifying who are the ones doing innovative work in the field who are in a position to collaborate with you. If you don't know who is doing what at what level, there is no chance of meaningful collaboration. In bringing arts into the neuroarts, let's not put it into boxes and make it as limiting as the current way of siloed thinking. Interdisciplinary communication barriers.

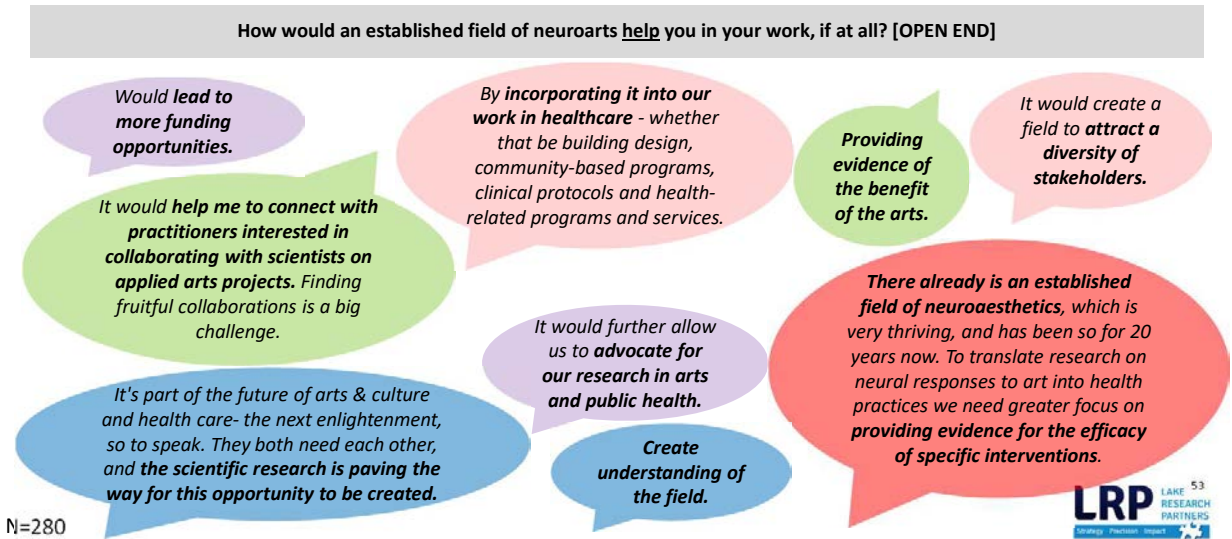
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Competing responsibilities, the absences of a centralized network/common language, and the nebulousness of the field to date are also common themes volunteered by stakeholders.

In your own words, what do you think is the greatest challenge (or challenges) in collaborating in neuroarts? Please explain why you think that is the greatest challenge? [OPEN END]		
Competing responsibilities or lack of time (15%)	Lack of centralized network and common language (15%)	Nebulousness of the field and limited evidence (14%)
<ul style="list-style-type: none">I think there are two problems. One is that many people who work in this field, such as myself, have a host of other responsibilities and activities that they are engaged in. The second is communication among people with like interests. We tend to be isolated.Competing interests and priorities within organizations (not just separate fields).The time it takes to build meaningful collaborations. No one - artist, scientist, or healthcare practitioner - is paid for that time. Developing a common language across disciplines. The competition inherent in a system where many people have been working for a long time with little compensation or recognition.Everyone is honestly so busy doing their thing. Priorities is the word. And collaboration takes commitment and a clear sense of the benefit for all parties.	<ul style="list-style-type: none">Establishing a baseline of understanding and a clear scope of desired outcome, where everyone's roles are clearly defined.Finding a common language and agreed-upon metrics by which to best convey the impact of arts and neuroscience as a collaborative discipline.Establishing a set of practices for conducting research in a new interdisciplinary field is one of the greatest challenges because metrics and methods of evaluation vary widely.As an artist, the language barrier in regard to each specialist jargon might propose a minor challenge. The learning curve of understanding medical terms and measurements will take time. In addition, building accessible for all to access and jump on board I feel will bring its challenges. Many organizations might not have the manpower nor funding to contribute-although the knowing of its importance is clear.	<ul style="list-style-type: none">Lack of understanding or questioning the credibility of the power of the arts on the mind. The arts take you to another space, one that is calm and peaceful.The nebulous nature of the field.It's emerging and not many people know of it. It has a PR problem, essentially.Explaining it to politicians.One of the largest challenges will be buy-in, especially amongst rural and other conservative-trending communities. It is important to stress hard data in the findings, so it doesn't look like touchy-feely mumbo jumbo. Hard evidence speaks volumes. There must also be a nuanced, multi-pronged approach; speaking to an M.D. versus an artist, versus a museum director can be very different styles of communication.

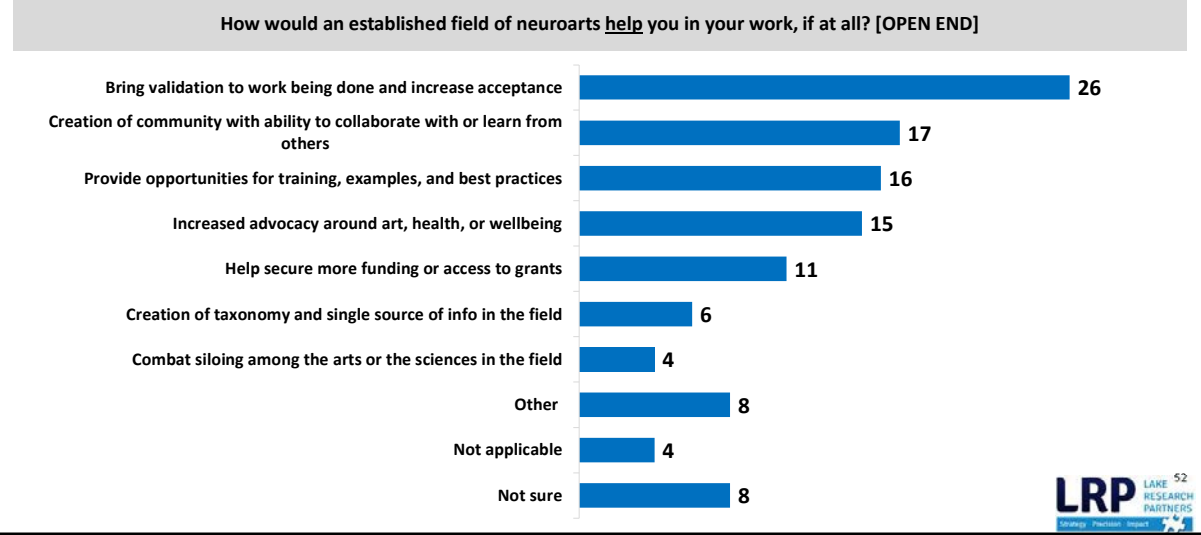
51

In their own words, stakeholders say an established field would help their work by “providing evidence of the benefit of the arts” and attracting “a diversity of stakeholders.” Others say it would help them by providing opportunities to “connect with practitioners interested in collaborating” and “lead to more funding opportunities.” Some note the field already exists and has for decades.



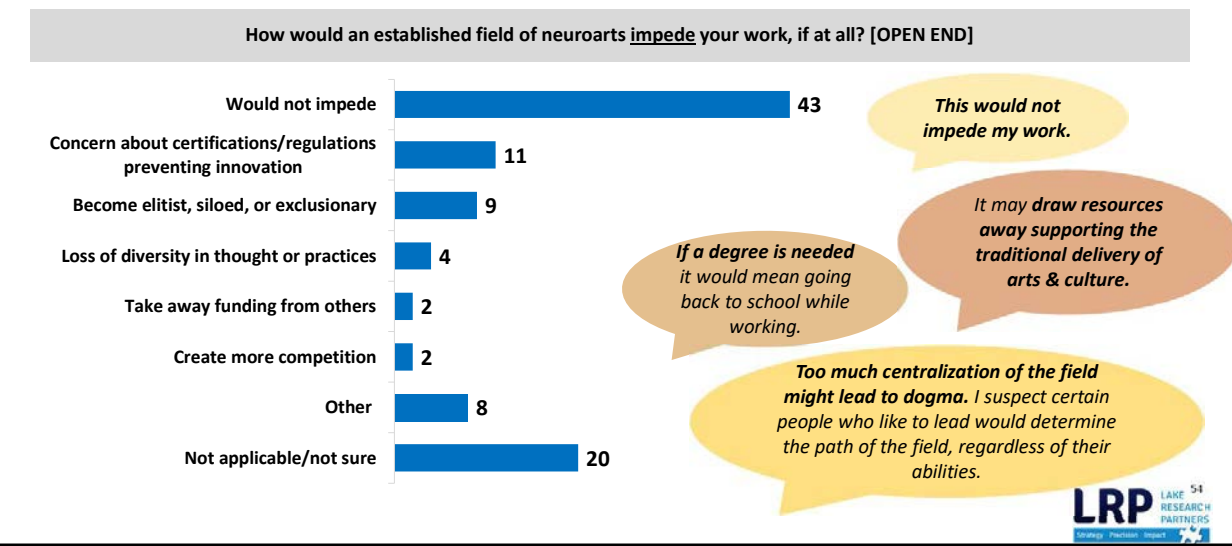
53

A plurality of stakeholders say an established field of neuroarts would help their work by bringing validation and increasing acceptance. In a second tier of benefits, stakeholders say the neuroarts field would help their work by creating a community that allows for collaboration, providing opportunities for training and best practices, and increased advocacy. At least one-in-ten also note how the established field would help secure more funding or access to grants.



52

A plurality of stakeholders say an established field of neuroarts would not impede their work and another two-in-ten say the idea is not applicable or they are not sure. About one-in-ten stakeholders share concerns about certifications being required or the field becoming elitist and siloed.



54

Language

55

Though intensity is strong across demographics, comparatively stakeholders who work in research and stakeholders who operate outside of the United States are slightly less likely than others to strongly agree with the statement.

Overall, do you agree or disagree with this statement?

Science has shown that art can work hand in hand with medicine to improve mobility, memory, and speech; relieve pain and the after-effects of trauma; enhance mental health; build resilience; and prevent disease. Among many other peer-reviewed research findings, we know that music improves cognitive function in people with dementia and relieves trauma; dance eases symptoms of Parkinson's disease; poetry helps patients face end-of-life challenges; and architecture promotes healing in the clinic and wellness in the workplace. The arts are also a community-building tool that can improve health for all.

	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
		M^	W	<50	50+	W	POC^	Research	Practice	Policy^	Everything, Else	Yes	No^	USA	Outside USA^
Strongly agree	76	74	79	74	79	77	71	63	81	75	78	76	76	78	65
Total agree	92	94	93	95	93	94	83	89	91	89	94	93	88	92	91
Strongly disagree	1	1	0	1	0	0	5	2	1	0	1	1	2	1	2
Total disagree	3	1	3	1	3	2	6	4	3	1	3	2	5	3	2
Net agree-disagree	+89	+93	+90	+93	+90	+92	+77	+86	+88	+89	+91	+91	+83	+89	+89

^ = N<80
^ = N<50

57

Taken in sum, a solid majority of stakeholders across gender, age, race, and location agree with the educational statement that speaks to the role of science and art working hand in hand with health and well-being.

Overall, do you agree or disagree with this statement?

Science has shown that art can work hand in hand with medicine to improve mobility, memory, and speech; relieve pain and the after-effects of trauma; enhance mental health; build resilience; and prevent disease. Among many other peer-reviewed research findings, we know that music improves cognitive function in people with dementia and relieves trauma; dance eases symptoms of Parkinson's disease; poetry helps patients face end-of-life challenges; and architecture promotes healing in the clinic and wellness in the workplace. The arts are also a community-building tool that can improve health for all.

56

Stakeholders align with the argument that a more holistic view of what promotes a community's health and well-being should be the foundation of neuroarts at higher rates than they do an individual's health and well-being when up against the argument that research and practices, need to be validated by standardized and rigorous quantitative and qualitative approaches. Across demographic subgroups, nearly four-in-ten believe both individual health and well-being, community health and well-being, and standardized approaches to be true.

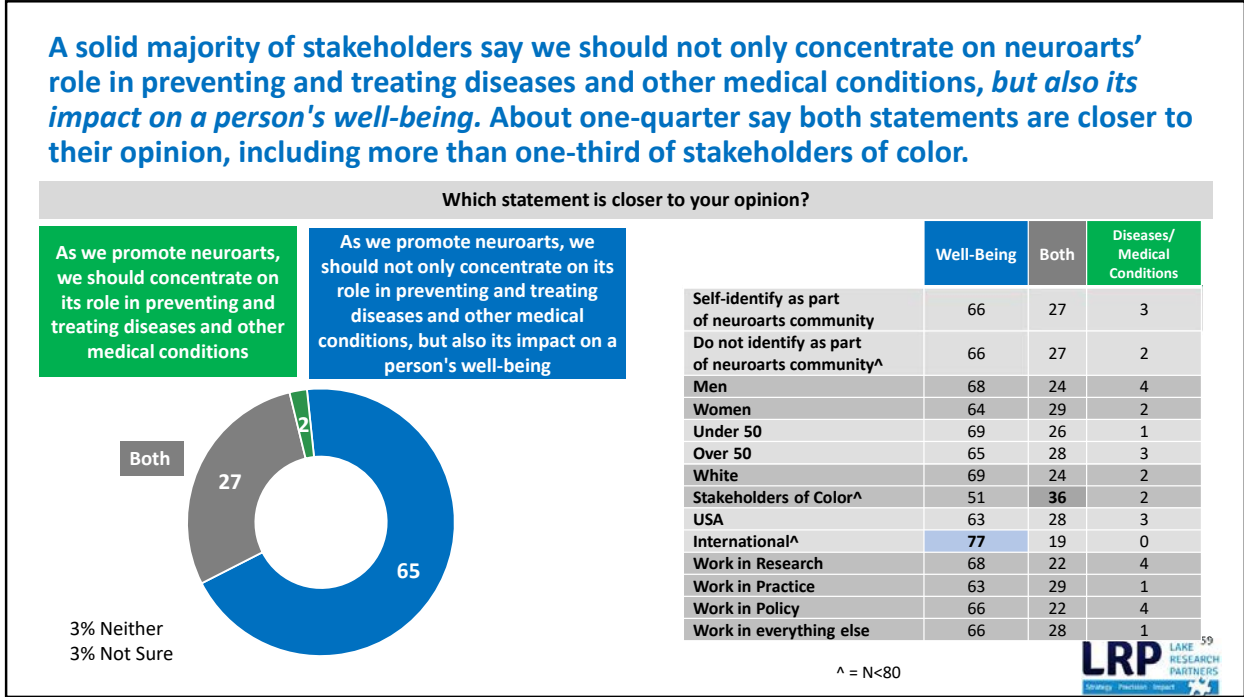
Which statement is closer to your opinion?*

[Standardized Approaches] In order to be considered part of the neuroarts field, research and practices need to be validated by standardized and rigorous quantitative and qualitative approaches

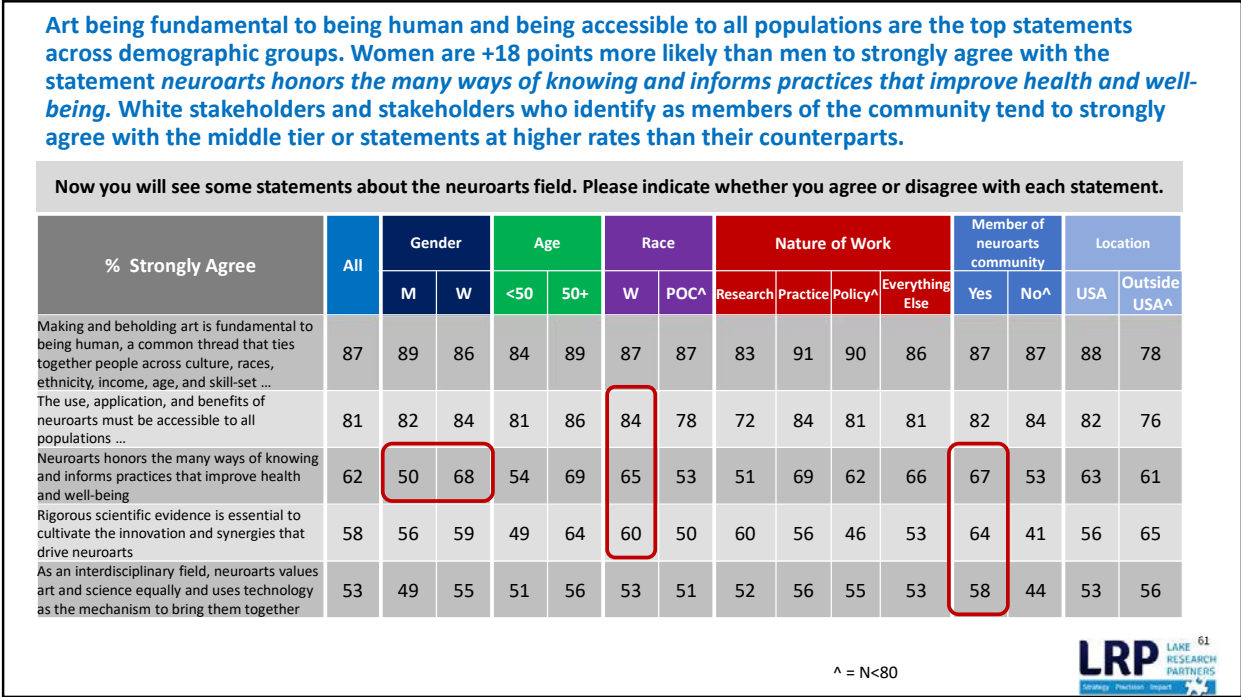
	Individual Health and Well-being	Community Health and Well-being
While standardized and rigorous quantitative and qualitative approaches help provide credibility to certain audiences, a more holistic view of what promotes an individual's health and well-being should be the foundation for neuroarts	36 (+23)	44 (+34)
While standardized and rigorous quantitative and qualitative approaches help provide credibility to certain audiences, a more holistic view of what promotes a community's health and well-being should be the foundation for neuroarts	13	10
41% Both 3% Neither 7% Not Sure		37% Both 2% Neither 7% Not Sure

*split sampled

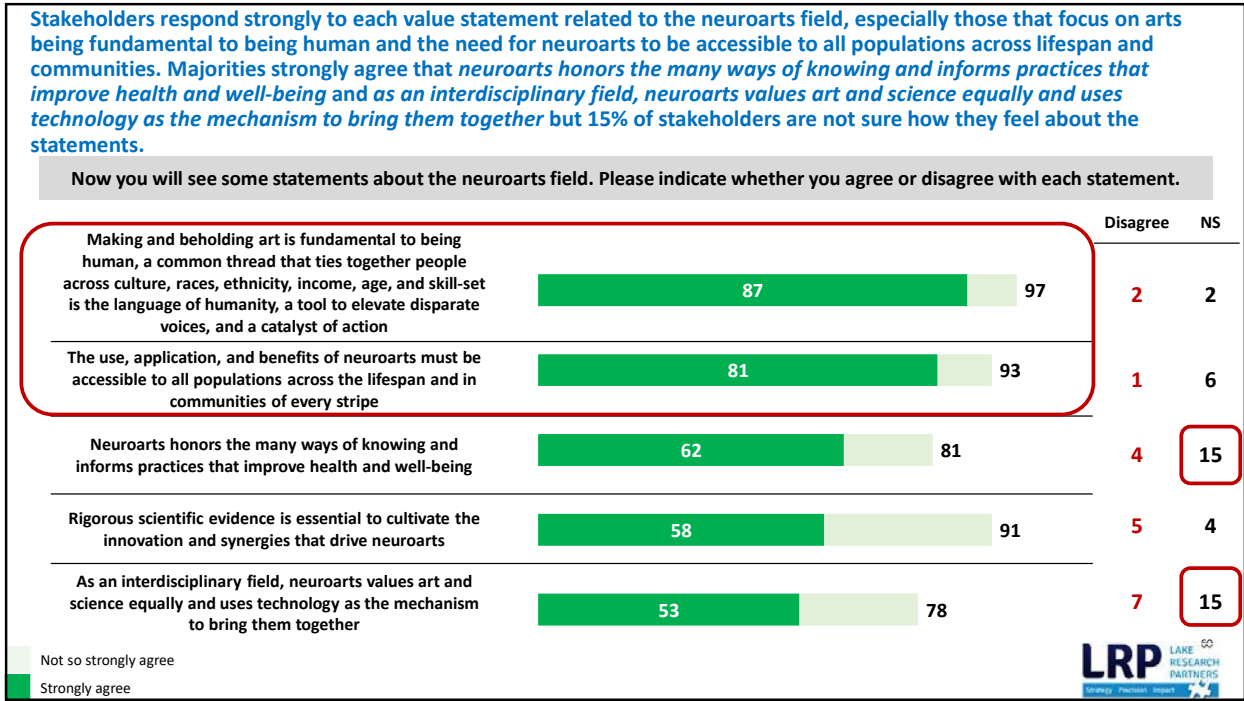
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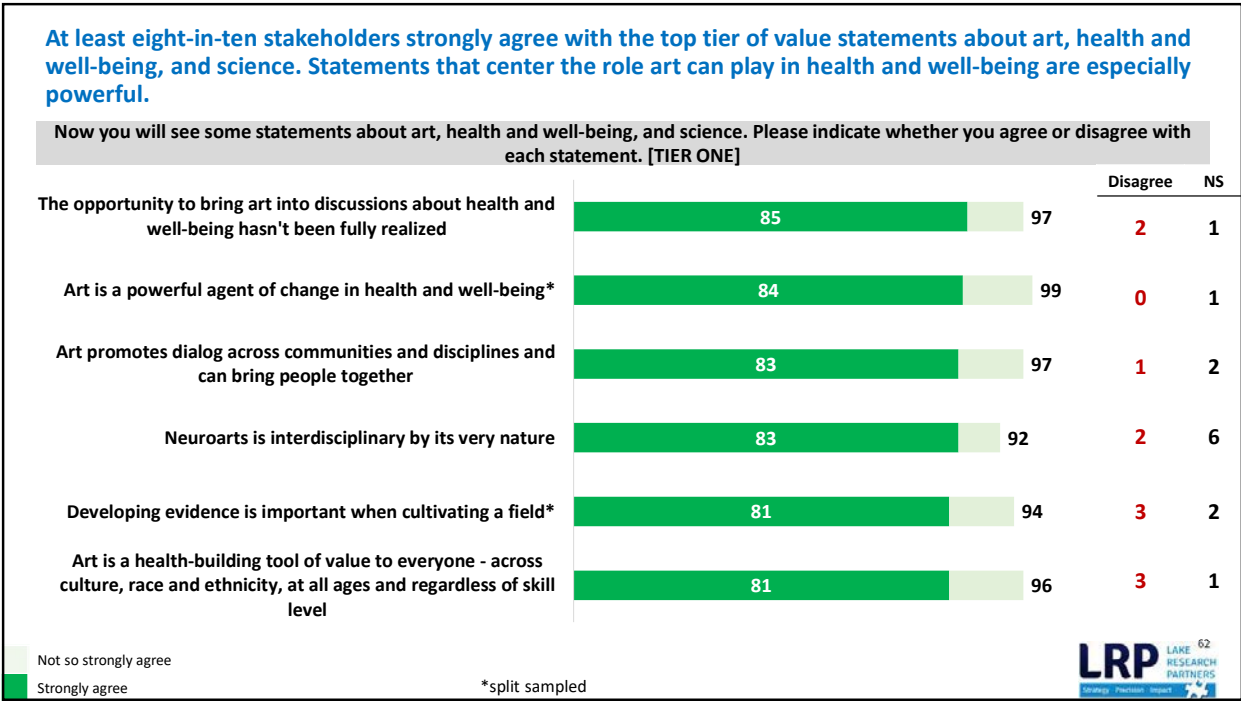
59



61



60



62

At least seven-in-ten stakeholders across demographics strongly agree with the top tier of statements and at least eight-in-ten stakeholders strongly agree that the opportunity to bring art into discussion about health and well-being hasn't been fully realized.

Now you will see some statements about art, health and well-being, and science. Please indicate whether you agree or disagree with each statement. [TIER ONE]

% Strongly Agree	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
		M	W	<50	50+	W	POC^	Research	Practice	Policy^	Everything Else	Yes	No^	USA	Outside USA^
The opportunity to bring art into discussions about health and well-being hasn't been fully realized	85	86	85	80	90	86	82	83	87	87	88	85	84	87	75
Art is a powerful agent of change in health and well-being*	84	-	87	87	85	86	-	74	90	-	82	85	-	86	-
Art promotes dialog across communities and disciplines and can bring people together	83	75	86	85	84	84	78	73	88	87	82	86	79	84	76
Neuroarts is interdisciplinary by its very nature	83	83	82	83	84	84	75	82	82	74	81	87	75	82	85
Developing evidence is important when cultivating a field*	81	-	82	81	86	85	-	84	81	-	80	85	-	83	-
Art is a health-building tool of value to everyone - across culture, race and ethnicity, at all ages and regardless of skill level	81	74	82	75	85	82	75	72	86	79	78	82	73	83	71

63

*split sampled

^ = N<80
- = sample is too small to analyze

LRP LAKE RESEARCH PARTNERS

63

At least six-in-ten stakeholders strongly agree with the second tier of value statements about art, health and well-being, and science, except for stakeholders who work in research. While a majority strongly agree, intensity among researchers is markedly lower toward the idea that neuroarts should have a role to play in patient-centered care.

Now you will see some statements about art, health and well-being, and science. Please indicate whether you agree or disagree with each statement. [TIER TWO]

% Strongly Agree	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
		M	W	<50	50+	W	POC^	Research	Practice	Policy^	Everything Else	Yes	No^	USA	Outside USA^
Developing evidence is important when cultivating the field of neuroarts*	79	-	83	72	86	88	-	84	78	-	79	87	-	79	-
Neuroarts should have a role to play in community-based programs that are intended to enhance health and well-being*	78	-	79	70	86	83	-	68	84	-	81	81	-	80	-
Neuroarts can advance the health and well-being of an individual*	77	-	80	80	77	77	-	63	79	-	77	80	-	77	-
Art is at the core of being human*	76	-	77	78	73	75	-	68	82	-	80	79	-	79	-
Science provides evidence that art changes the body and brain*	76	-	80	70	80	76	-	66	78	-	76	82	-	79	-
Neuroarts can advance the health and well-being of communities*	73	-	74	71	78	75	-	62	77	-	85	81	-	75	-
Science and technology provide evidence that art changes the body and the brain*	72	-	74	80	73	74	-	68	76	-	75	76	-	75	-
Neuroarts should have a role to play in patient-centered care, which is increasingly being emphasized in health care delivery*	71	-	74	71	72	73	-	55	76	-	67	75	-	73	-

65

*split sampled

^ = N<80
- = sample is too small to analyze

LRP LAKE RESEARCH PARTNERS

65

At least seven-in-ten stakeholders strongly agree with value statements about art, health and well-being, and science, particularly statements that speak to the importance of developing evidence, the role neuroarts plays in community-based programs as well as individual health and well-being, and how art is at the core of being human.

Now you will see some statements about art, health and well-being, and science. Please indicate whether you agree or disagree with each statement? [TIER TWO]

			Disagree	NS
Developing evidence is important when cultivating the field of neuroarts*	79	96	1	3
Neuroarts should have a role to play in community-based programs that are intended to enhance health and well-being*	78	94	0	6
Neuroarts can advance the health and well-being of an individual*	77	94	2	4
Art is at the core of being human*	76	93	5	2
Science provides evidence that art changes the body and brain*^	76	91	4	5
Neuroarts can advance the health and well-being of communities*	73	91	2	7
Science and technology provide evidence that art changes the body and the brain*	72	91	4	5
Neuroarts should have a role to play in patient-centered care, which is increasingly being emphasized in health care delivery*	71	91	4	5

64

Not so strongly agree
Strongly agree

*split sampled

^Regression analysis shows the statement *science provides evidence that art changes the body and brain* predicts to higher levels of engagement in the neuroarts community.

LRP LAKE RESEARCH PARTNERS

64

At least two-thirds of stakeholders strongly agree that neuroarts can bridge the gap between researchers/practitioners and artists, the length of time it will take to cultivate the field, and the idea that no art modality should be excluded from the field of neuroarts. Though a majority agrees overall, one quarter of stakeholders are not sure that *in order to cultivate the field, neuroarts needs a center of gravity* and intensity is low.

Now you will see some statements about art, health and well-being, and science. Please indicate whether you agree or disagree with each statement? [TIER THREE]

			Disagree	NS
Neuroarts can bridge the gap between the way researchers and healthcare practitioners think about health and well-being and the way artists think about health and well-being	67	89	4	8
Cultivating neuroarts as a field is a marathon, not a sprint, with short-term wins along the way	66	90	2	7
No art modality should be excluded from the field of neuroarts*	66	86	3	11
All art modalities need to be included in the field of neuroarts*	62	86	5	9
Research, practice, policy, funding, leadership, and collaboration are the core elements of neuroarts	62	86	6	8
Measurement tools are essential to evaluate the power of art	53	84	11	5
To cultivate the field, neuroarts needs a center of gravity	32	64	11	25

66

Not so strongly agree
Strongly agree

*split sampled

LRP LAKE RESEARCH PARTNERS

66

White stakeholders tend to strongly agree at higher rates than stakeholders of color with the third tier of statements, as do stakeholders based in the United States and older stakeholders.

Now you will see some statements about art, health and well-being, and science. Please indicate whether you agree or disagree with each statement. [THIRD TIER]

% Strongly Agree	All	Gender		Age		Race		Nature of Work				Member of neuroarts community		Location	
		M	W	<50	50+	W	POC^	Research	Practice	Policy^	Everything Else	Yes	No^	USA	Outside USA^
Neuroarts can bridge the gap between the way researchers and healthcare practitioners ... and the way artists think about health and well-being	67	65	69	64	72	70	58	60	74	64	68	72	60	70	54
Cultivating neuroarts as a field is a marathon, not a sprint ...	66	63	69	57	73	67	64	71	67	63	69	71	56	66	65
No art modality should be excluded from the field of neuroarts*	66	-	67	65	70	70	-	60	71	-	61	67	-	68	-
All art modalities need to be included in the field of neuroarts*	62	-	72	72	60	63	-	61	65	-	66	61	-	66	-
Research, practice, policy, funding, leadership, and collaboration are the core elements of neuroarts	62	60	63	60	65	64	54	61	60	58	61	67	50	61	61
Measurement tools are essential to evaluate the power of art	53	49	56	48	59	56	44	55	47	50	48	55	45	52	48
To cultivate the field, neuroarts needs a center of gravity	32	22	38	34	33	31	39	33	33	41	30	33	27	34	21

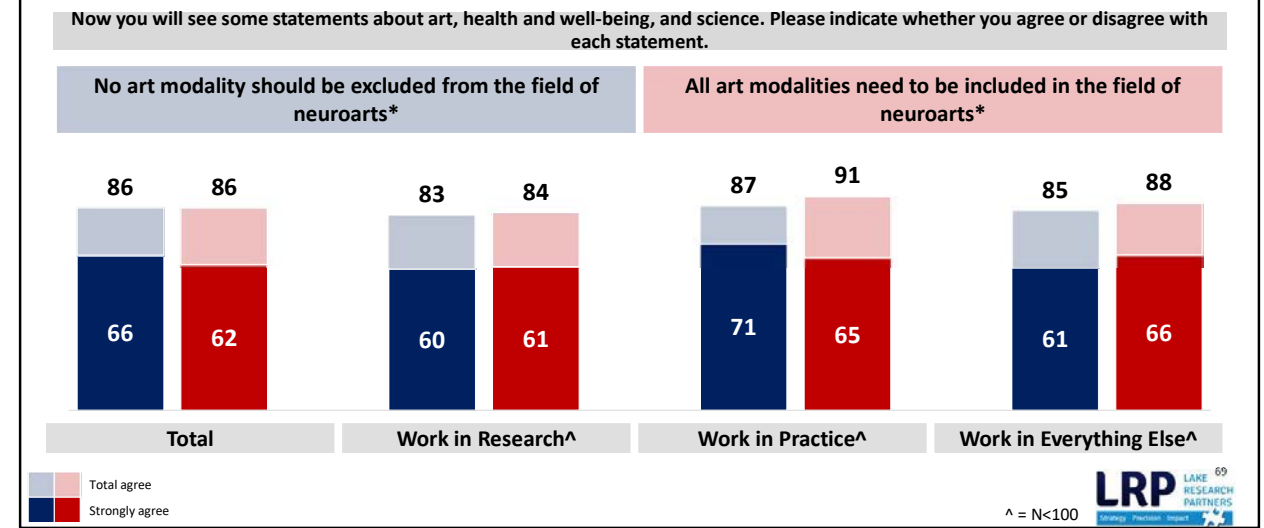
*split sampled

^ = N<80
- = sample is too small to analyze

LRP LAKE RESEARCH PARTNERS

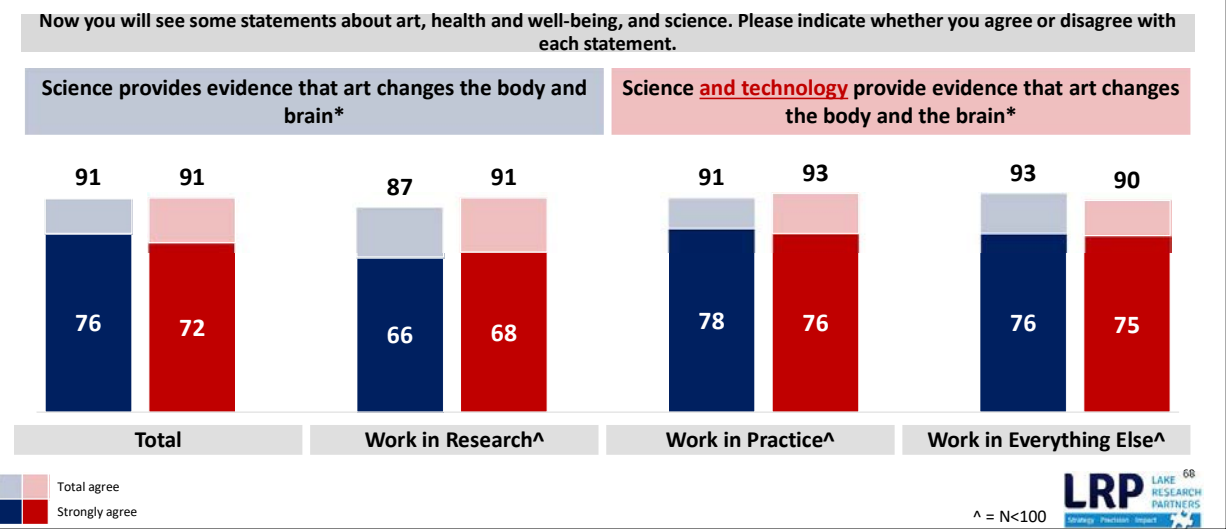
67

Whether phrased positively or negatively, at least six-in-ten stakeholders across fields strongly agree art modalities should be included in the field of neuroarts.



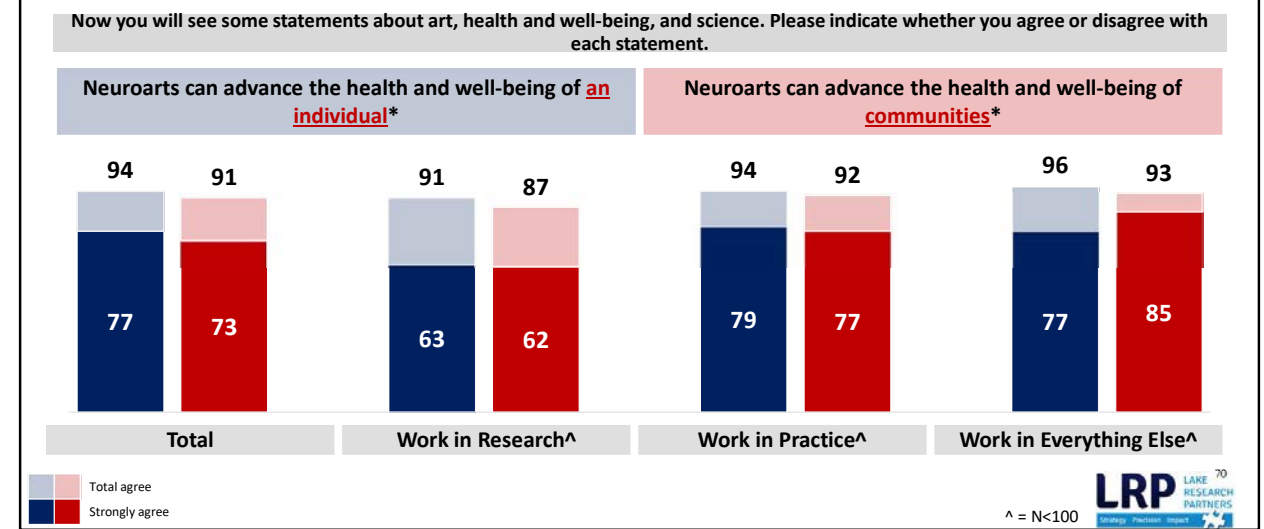
69

Referencing either science alone or science and technology together results in high agreement from stakeholders overall and across fields.

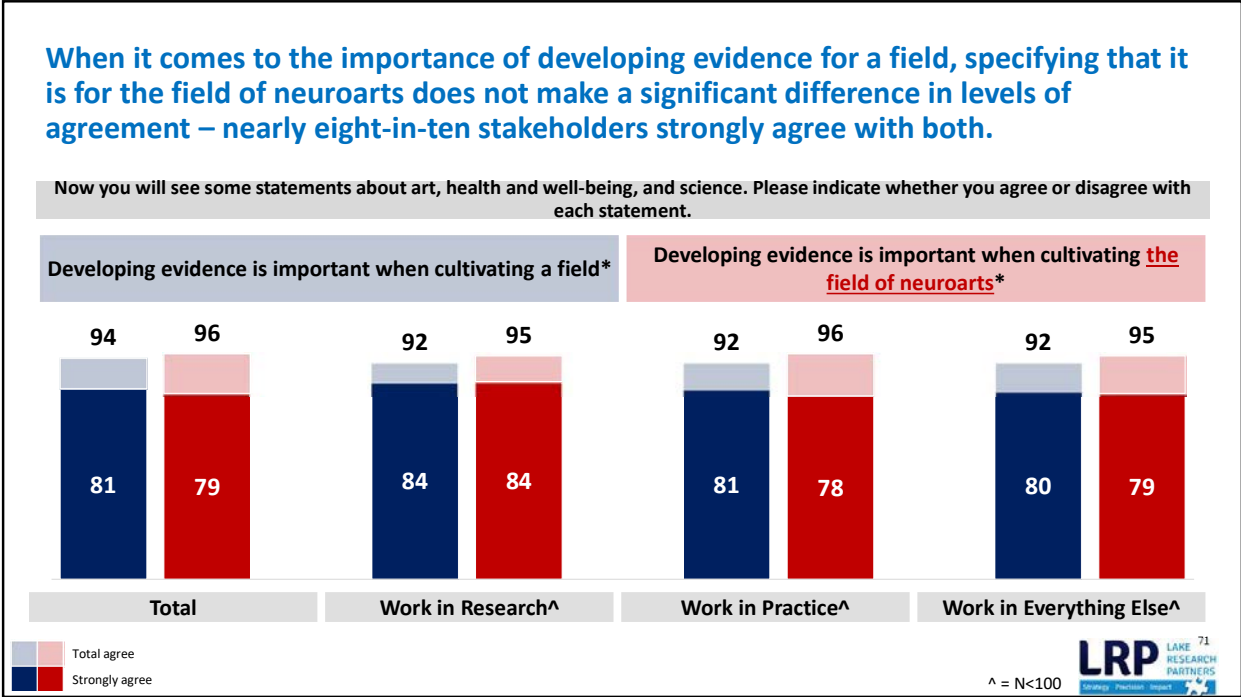


68

Stakeholders, regardless of the fields they work in, are just as likely to agree neuroarts can advance the health and well-being of an individual as well as communities.



70

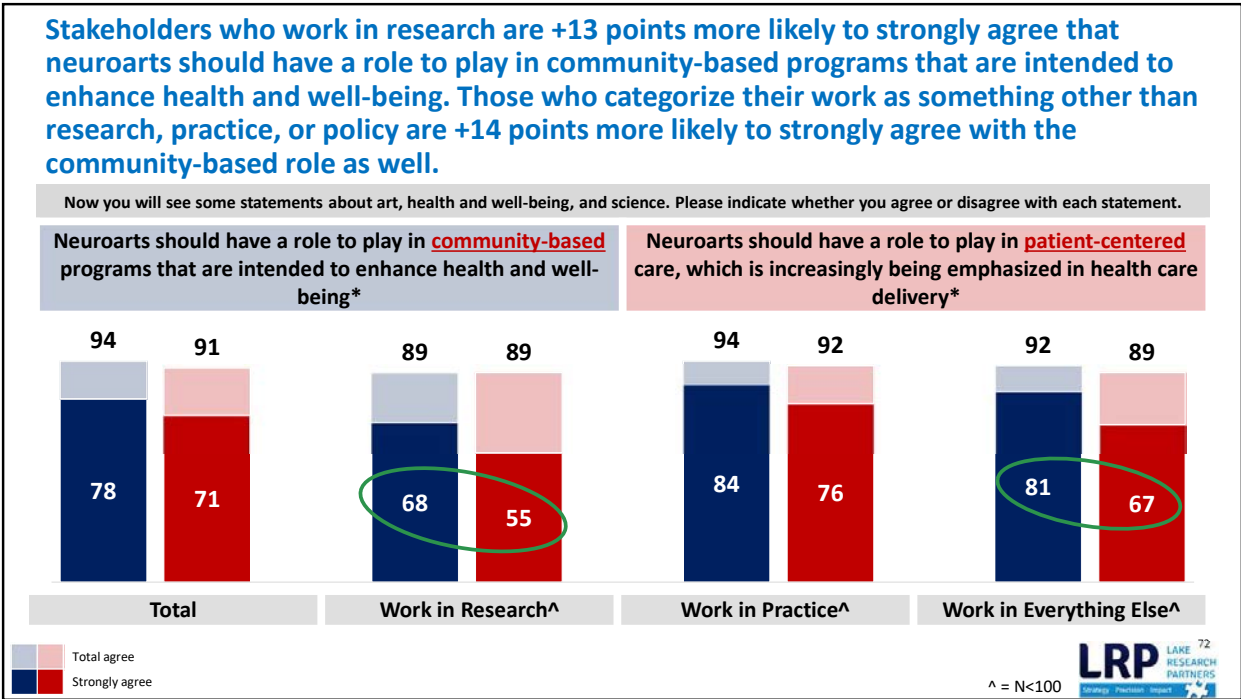


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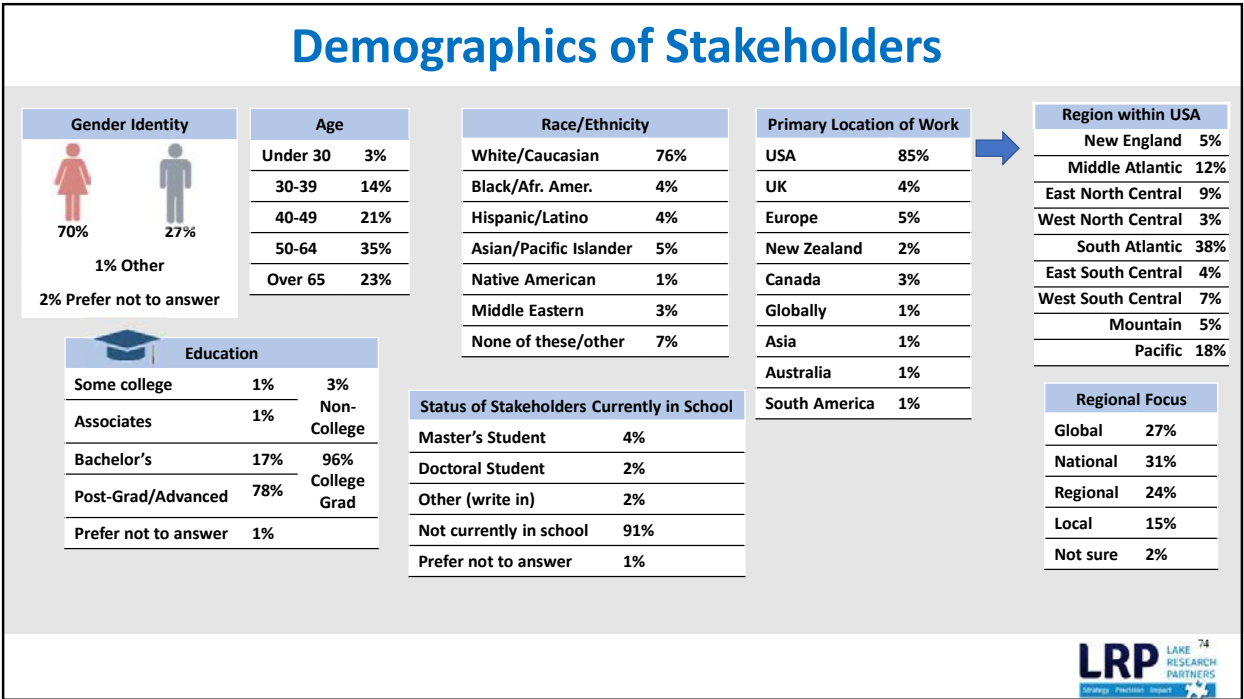


Appendix

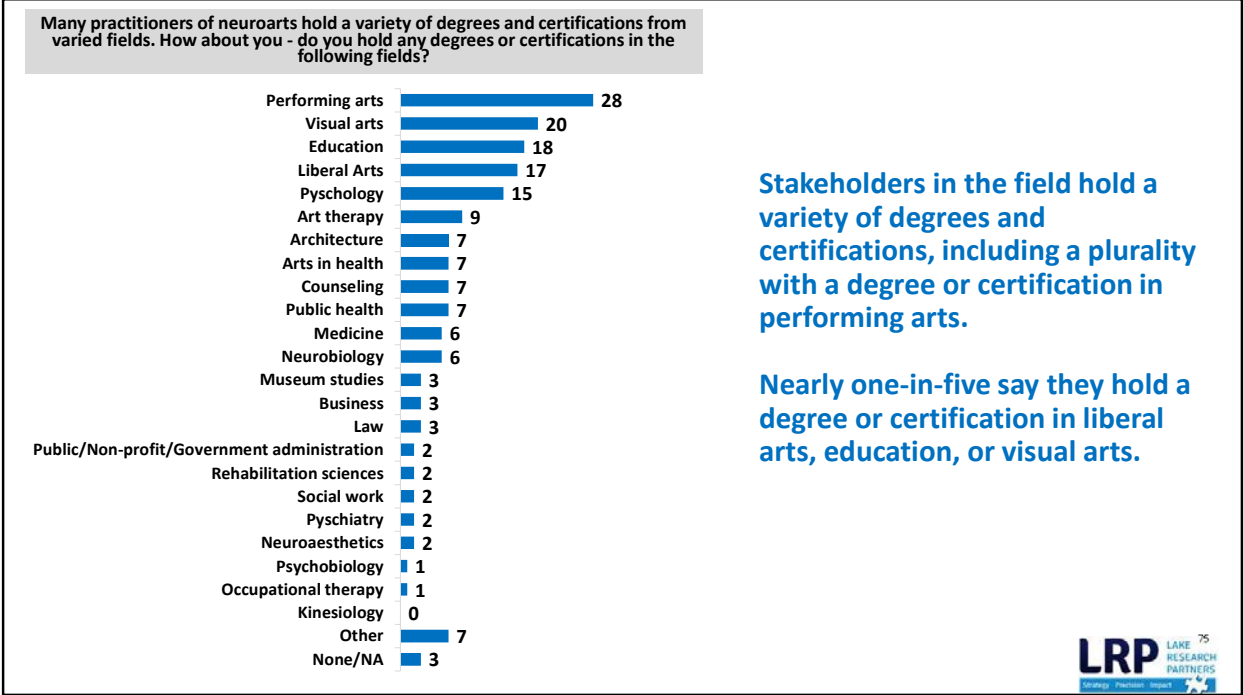
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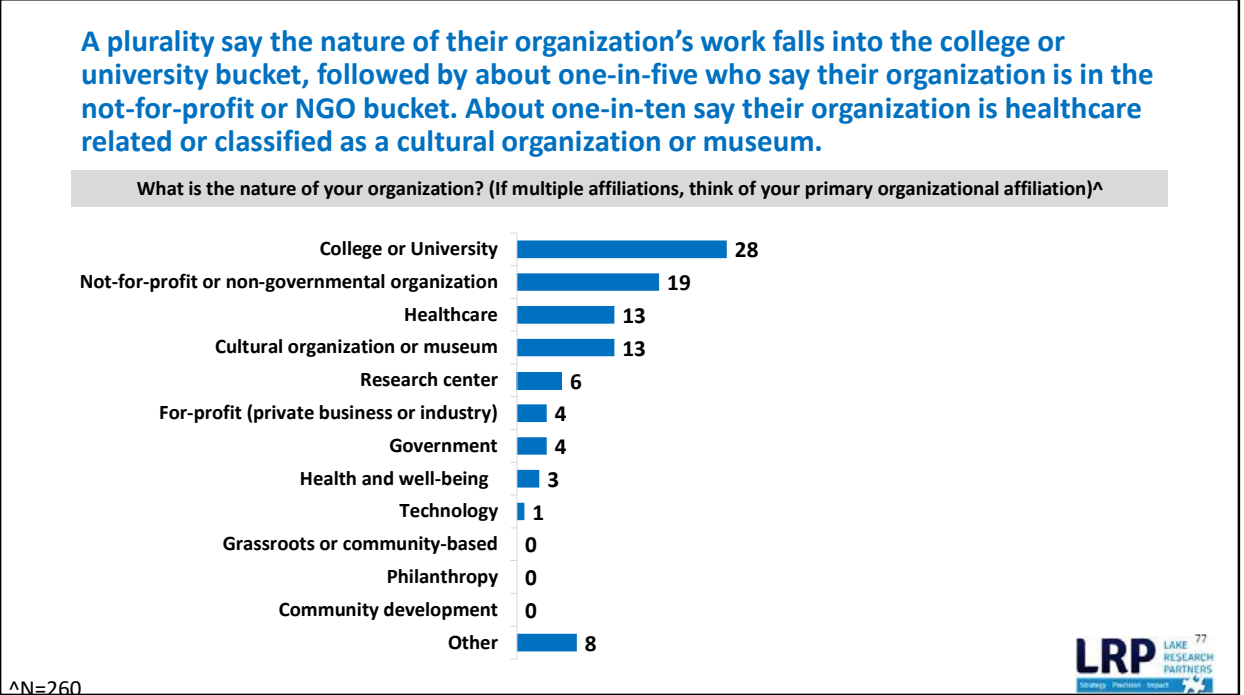
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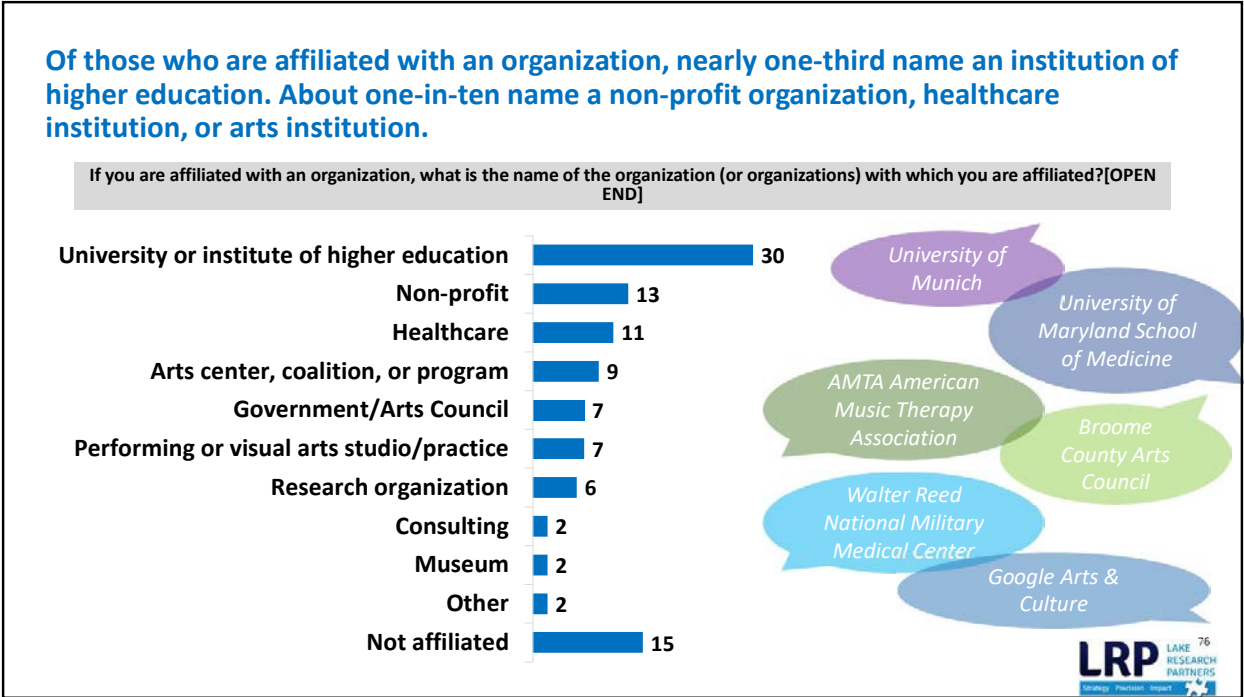


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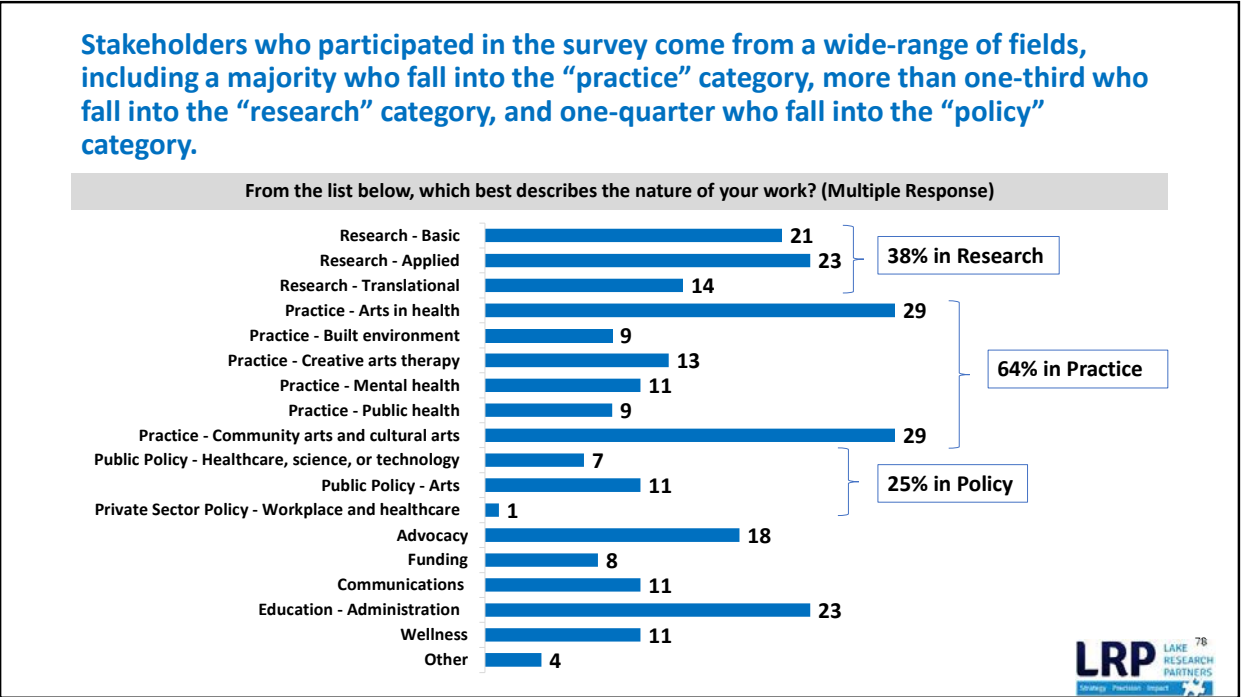


^N=260

77



76



78

A majority of stakeholders say both their organization and they personally work with all adults. At least half say their organization currently works with performers and artists, college and university students, and the BIPOC community.

TIER ONE	Which of the following populations and constituencies does your organization currently work with? [^] (Multiple Response)	And thinking about your own professional activities, which of the following populations and constituencies do you currently and primarily work with? (Multiple Response)
All adults	70	62
Performers and artists	59	46
College and university students	57	41
Black, Indigenous, and people of color	52	34
Urban communities	49	35
Under-resourced communities	46	27
Healthcare practitioners	44	27
People with disabilities	43	23
Older adults	43	29
Children in general	43	24
Suburban communities	39	23
Pre-K-12 students	36	23
Healthcare patients	35	27
Rural communities	33	16

79

[^]N=260

Visual arts, music and sound, performing arts, and dance and movement are the most commonly used art disciplines or aesthetic experiences used by stakeholders' organizations.

Visual arts and music and sound are the most commonly used by the stakeholders personally.

	What art disciplines or aesthetic experiences does your organization use in its line of work, if any? [^] (Multiple Response)	And thinking about your own professional activities, what art disciplines or aesthetic experiences do you use in your line of work, if any? (Multiple Response)
Visual arts	67	56
Music and sound	64	49
Performing arts	59	41
Dance and movement	50	31
Literary arts	46	36
Media arts	41	31
Architecture, design, built environment	33	24
Artisanal/traditional arts or handiwork	24	21
Nature	24	23
All arts and culture fields	2	1
Other	2	3
None (do not use art in my work)	5	9
Not sure	5	1

81

[^]N=260

At least one-quarter of stakeholders' organizations currently work with mental health patients, military and veteran populations, and workforce.

TIER TWO	Which of the following populations and constituencies does your organization currently work with? [^] (Multiple Response)	And thinking about your own professional activities, which of the following populations and constituencies do you currently and primarily work with? (Multiple Response)
Mental health patients	29	18
Military and veteran populations	28	9
Workforce	26	16
Immigrant or refugee populations	22	9
Faith-based populations	19	7
Children, from birth to age 3	17	8
Populations experiencing homelessness	15	9
Populations experiencing incarceration	13	5
Other (write in)	1	3

80

[^]N=260

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Human Capital and the Arts at the World Bank Group

NeuroArts Blueprint

Human Capital and the Arts at the World Bank Group (WBG)

A look at how arts-informed economic interventions can be leveraged to improve health, well-being and economic growth

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Zanaki Primary School is a public primary school in Dar es Salaam, Tanzania, started in 1957. It has a total of 1167 students today, of which 54% are girls. It received a School Improvement Grant in 2016 financed by the World Bank for its substantially improved student performance on the national Primary School Leaving Examination. Photo: Sarah Farhat / World Bank

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Human Capital: Health, Wellbeing, and Economic Growth



Sogman primary school is the second biggest school in the district of Sejnane and counts 263 pupils, 3 levels and 11 teachers. Pupils in the French class are between 9 and 10 years old Photo: Arne Hoel / World Bank

“

Preventing a child from fulfilling his or her potential is not only fundamentally unjust, but it also limits the growth potential of economies whose future workers are held back. GDP per worker in Sub-Saharan Africa could be 2.5 times higher if everyone were healthy and enjoyed a good education from pre-school to secondary school.

—Hafez Ghanem, World Bank President for Africa, in World Bank (2019)

The World Bank Group (WBG) believes that by improving skills, health, knowledge, and resilience—human capital—people can be more productive, flexible, and innovative. As highlighted in the 2019 *World Development Report (WDR): The Changing Nature of Work*, markets are increasingly demanding workers with higher levels of human capital, especially advanced cognitive and sociobehavioral skills (World Bank 2018a).

Yet previous reports, including *WDR 2018: Learning to Realize Education's Promise*, make it clear that children in many countries are struggling to learn in school. Nearly a quarter of children worldwide are stunted, leaving them vulnerable to poor cognitive development and hampering their ability to learn. Meanwhile, half the world's population is not covered by essential health services, and 80 percent of poor people in low-income

countries lack a social safety net.

To fully understand the nature of the problem, the World Bank Group launched the first version of the Human Capital Index (HCI) in October 2018. The HCI is a cross-country metric developed in part from the recognition that creating transparent, easily understood metrics has historically helped to build consensus around complex issues. The HCI measures the amount of human capital that children born today can expect to achieve in the country in which they live. Human capital is defined according to three components: survival (measured using the under-5 mortality rate), expected years of learning-adjusted school (a measure of the quantity of education a child can expect to obtain by age 18 combined with a measure of quality), and health (the rate of stunting of children under age 5 and the adult

survival rate, defined as the proportion of 15-year-olds who will survive until age 60).

The health and education components of the index are combined to reflect their contribution to worker productivity, based on evidence from microeconomic empirical studies. The resulting index ranges between 0 and 1. A country in which a child born today can expect to achieve both full health (no stunting and 100 percent adult survival) and full education potential (14 years of high-quality school by age 18) will score a value of 1 on the index. A score of 0.70 thus signals that the productivity as a future worker for a child born today is 30 percent below what could have been achieved with full health and complete education. The HCI is linked to real differences in how much income a country can generate in the long run. If a country has a score

of 0.50, then the gross domestic product (GDP) per worker could be twice as high if the country reached the benchmark of 1.

The HCI provides a bird's-eye view of each country's level of human capital. The larger Human Capital Project has also launched a program of data and analytical work to improve the measurement of a wide range of human capital outcomes, better understand how human capital is accumulated, and identify the country policies that can promote it. It is within this larger program, designed to enhance understanding of how human capital is accumulated, that arts-informed economic interventions can be leveraged.

Arts-Informed Economic Interventions for Human Capital

Arts-informed economic interventions help to grow human capital. As is evident in the projects explored in this paper, arts-informed interventions have been associated with higher rates of female employment, increased social cohesion within communities that have substantial ethnic minority populations, decreases in violent behavior, and better mental health, all of which can generate measurable improvements in a country's economic performance.

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 (Stuckey & Nobel 2020). Those health benefits, in turn, are deeply linked to economic performance, in part because people are more productive when they are healthier.

In Nigeria, for example, a program providing malaria testing and treatment increased workers' earnings by 10 percent in just a few weeks (Montenegro & Patrinos 2014). A study in Kenya showed that deworming in childhood reduced school absences while raising wages in adulthood by as much as 20 percent (Horton & Steckel 2011). Evidence from the United Kingdom revealed that schoolchildren who had healthier diets significantly increased their achievements in English



A woman embroiders the belt to hold the traditional jambia (dagger) at the National Women's Handicraft Center for Development of Handicrafts in Souq Almelh, in the Old City. The Social Fund for Development supports the center that provides vocational training for women and markets the handicrafts they produce. Republic of Yemen. Photo: Dana Smillie / World Bank

and science (Kraay 2018; Weil 2007). Meanwhile, a multicountry study in Southeast Asia found that both underweight and obese children had lower IQ scores than healthy-weight children (Kraay 2018). In India, giving preschoolers mathematics-based games generated enduring improvements in their intuitive abilities (IHME, n.d.). Other research shows that proper nutrition in utero and in early childhood improves children's physical and mental well-being and that better prenatal care improves infant health.

These individual returns on health add to human capital, which then accumulates and generates large benefits for economies—to put it simply, countries become richer as more human capital accumulates. Human capital complements physical capital in the production process and is an important input to technological innovation and long-run growth. As a result, between 10 and 30 percent of the difference in



Helina, (center), 25, works for a real estate construction firm in Addis Ababa, the capital of Ethiopia. She is overseeing the construction of three apartment buildings. Women working in construction used to be a rare sight in Addis but because of a construction boom, more women are wearing hard hats. World Bank research shows that sectors that are traditionally male-dominated provide an opportunity for women to earn higher returns. Photo: © Stephan Gladieu / World Bank

per capita gross domestic product (GDP) differences is attributable to cross-country differences in human capital (Kraay 2018). That percentage could be even higher when the quality of education and the interactions between workers with different skills are factored in. By generating higher incomes, human capital accelerates the demographic transition and reduces poverty.

Over the longer term, human capital matters for societies. In the mid-1970s, Nigeria introduced universal primary education, sending a large cohort of children through primary school who otherwise would not have gone. Years later, the members of that cohort were found to be more engaged in political life. They paid closer attention to the news, spoke to their peers about politics, attended community meetings, and voted more often than those who did not go to primary school. Similarly, young participants in the National Volunteer Service Program in Lebanon, an intercommunity soft-skills training program, display higher levels of overall tolerance (World Bank 2018a). As the scientist Marie Curie once said, "You cannot hope to build a better world without improving the individuals"

Despite the documented promise of arts-informed interventions to improve health and build human capital, the generally low number of such WBG projects suggest that there are barriers to pick up that must be addressed. The most often cited challenge is that arts

are perceived as "cute," a soft activity that cannot be measured and has no direct impact. Art in that framing is viewed as an object for museums or performance spaces, useful only to those who "get it," not as a process for community engagement or individual capacity-building. Additionally, and especially in international development settings, many feel that art and culture pose far too large a political risk to be used in lending projects where the client is a government.

The projects described in this paper reveal these perceptions to be false and mitigable. But dispelling widely held beliefs requires continual evidence that the development-positive spinoff effects of art can be measured and linked to frameworks that are already in place for international development projects. It requires, too, the ability to show that making and beholding art is not a static process but rather one that can yield significantly more robust human capital.

Certain motivating factors both at the project and institutional levels set the stage for the successful pickup and use of arts-informed interventions. This paper showcases a variety of WBG projects and research that created the opportunity to use arts-informed interventions to build human capital by drawing on precedent, institutional value-add, alignment, a need for out-of-the-box thinking, measurability, partnerships, innovation, and economic and policy implications.

Case Studies

In the examples that follow, arts-informed interventions have been used to increase employment in Afghanistan; social cohesion among local and refugee populations in Lebanon; educational attainment by youth in North Macedonia; psychosocial skills among refugees in Bangladesh; mental health, prosocial behavior, and educational outcomes in Colombia; and cognitive power

in youth exposed to high levels of violence in El Salvador; and to foster innovative communication methods for climate change around the globe. Each one of these development outcomes has a direct impact on individual health and well-being, linking it to the attainment of larger human capital growth.

The Afghanistan Skills Development Project

Increasing Employability in Afghanistan

In 2002, Afghanistan began a process of reconstruction and recovery following the overthrow of the Taliban. Despite making remarkable progress in the five years that followed, by 2007 Afghanistan still had concerns over security, rule of law, persistent poverty, and weak institutional capacity. The country’s labor force lacked the requisite skills to sustain the recovery, a skills shortage that spanned all sectors. More than 80 percent of Afghan workers were employed in the informal economy, and the vast majority lacked the basic technical competencies and literacy to take advantage of opportunities through more formalized self-employment or small enterprise development. To address the job-specific skills shortage, the government of Afghanistan began to rebuild the country’s Technical and Vocational Education and Training (TVET) system. The Afghanistan government requested World Bank technical and financial assistance to ensure that the TVET system would be of high quality and impactful. Building the TVET consisted of selecting, financing, and developing a portfolio of organizations that provided skill-building opportunities for Afghans.

This skills development project is organized according to four goals. Two of these goals focus on increasing the total number of employed and employable TVET graduates, while the other two goals focus on building the capacity of TVET managers to successfully regulate and grow the TVET system in perpetuity.

Arts-Informed Economic Intervention

The arts-informed economic intervention for this project is an investment in the Afghanistan National Institute of Music (ANIM) as one of the organizations to make up the TVET system. The ANIM was identified as a tool to achieve the first set of project goals: to increase the employment of graduates of the TVET system.

Motivating factors for the use of an arts-informed intervention

Alignment

ANIM directly addressed equity, an important crosscutting theme embedded within the strategy for the project, focusing intentionally on populations, such as women, with historically less access to opportunities.

Measurability

ANIM could consistently prove—qualitatively through employer surveys and quantitatively through total number of employed graduates—that their program increased not only the total number of employable individuals in Afghanistan but also the number of employed individuals.

When identifying appropriate organizations to select for the TVET portfolio, the World Bank Group mandated that crosscutting development factors be considered. In addition to providing quality skill-building opportunities, the organizations needed to consider how they were providing those opportunities, and to whom. In particular, the WBG looked at how each organization reached lesser-served Afghanistan populations, such as women and disadvantaged youth (World Bank 2016b; 2015b). Through this lens, the WBG identified ANIM’s approach as particularly equitable in its service delivery, making it a desired investment.

Additionally, the ANIM had a proven history of sound management planning, strong leadership, and clear recordkeeping to track their graduates’ employment success. These factors allowed the WBG to confidently translate the arts-based work of ANIM into a clear development measurement framework. The WBG was able to track the total number of graduates and the demographics they represented to prove how ANIM was growing Afghanistan’s workforce. The WBG was also able to design surveys to capture why employers ultimately hired TVET graduates and how those reasons matched the characteristics ANIM developed in its graduates. ANIM’s mission, approach, and leadership aligned with the development framework already in use by the WBG for other lending projects (World Bank 2015a).



Small but steady steps to empower women in Afghanistan. Source: Kerali 2020

Lebanon Municipal Services Emergency Project

Building Social Cohesion

In June 2014, Lebanon saw an unprecedented influx of refugees fleeing violent conflict in Syria. Some 1.5 million Syrian refugees entered Lebanon at the onset of the crisis, swelling the country’s population by nearly 25%. Lebanon chose not to establish refugee camps, so the majority of incoming Syrian refugees settled in urban and rural Lebanese communities, many of them already poor and underserved. The sudden increase in demand for services at the local level, where Lebanese and Syrians were interacting, sharing living space, and competing for jobs and access to services, placed mayors and municipal councils under mounting pressure. Local authorities became the principal actors responsible for managing rising social tensions and were often unable to service the growing needs.



Syrian refugees learn to finger paint by their Lebanese teacher, Khadga Eter (center) during class in Zouq Bhanin Village, Lebanon on March 22, 2016. Photo © Dominic Chavez/World Bank

This project was organized according to three goals:

- To alleviate the most immediate stresses on crucial municipal services, including water supply and wastewater, solid waste management, roads, recreational facilities, and community centers.
- To prepare for municipal needs that would become apparent in the longer term by proactively investing in high-priority, mid-size infrastructures.
- To support communal initiatives that promoted interaction and collaboration between the refugee and local population to facilitate social harmony (World Bank 2018c).

At the highest level, this project functioned in the belief that the influx of Syrian refugees in Lebanon was not only a humanitarian challenge for refugees but also a development challenge for host communities, which must create expanded municipal-level systems and services to support an exponentially greater total population.

Arts-Informed Economic Intervention

The arts-informed intervention for this project was the creation of a series of 132 visual arts workshops in 22 Lebanese public schools across the country. These workshops, developed in partnership with the Art Program of the WBG and the United Nations Educational, Scientific and Cultural Organization (UNESCO), were structured so that Lebanese and

Motivating Factors for Using an Arts-Informed Intervention

Unexpected need for out-of-the-box thinking	Readily available arts expertise	Alignment
As this project was implemented, it became evident that social tensions between host and refugee populations were preventing the effective delivery of municipal services. The arts workshops had not been embedded into the original project design but were developed as the need for a creative solution to ease tensions became apparent.	UNESCO was a ready and able partner, bringing niche expertise to the implementation of arts workshops. This allowed the WBG to feel confident in standing by the quality of the arts program that would be associated with its name and reputation (World Bank 2017).	The workshops were designed to engage women, and both the refugee and host populations. The engagement of these three communities was an express metric that needed to be achieved for the project to be deemed successful.

displaced Syrian children would work side by side to create paintings, sculptures, poems, and short stories based on their interpretations of the word “home.” In collaboration with teachers and artists, the children produced some 88 sculptures, 22 canvases, and 22 literary works.

This arts-informed intervention was used to achieve the third goal of the project—social cohesion—recognizing that without a harmonized society, the infrastructure designed to serve the newly blended population would not be used. Fear of and disrespect for the “other” was thwarting the uptake of public services and a space for safe and prolonged cultural learning needed to deconstruct this barrier. As the WBG’s Art Program director Marina Galvani said, “To facilitate delivery of urban services needed by the Lebanese host communities and displaced population, the social capital of these diverse groups had to be prioritized. The focus had to shift to the networks of relationships between the people who live and work together, for their communities to function effectively.”

To build these networks of relationships, UNESCO contributed its expertise in artistic program development, co-leading 132 artistic workshops

across 22 Lebanese public schools throughout the country. In many cases, these school-based workshops were the sole setting in which the two populations were in the same space at the same time, providing a unique opportunity for Lebanese and displaced Syrian children and adolescents to work collectively. This act of exploring each other’s culture and heritage in a safe space helped ease tensions across communities (World Bank 2017).

To further leverage these workshops in demonstrating the benefits of peaceful coexistence, two exhibitions of the artworks were hosted by the World Bank Group: one in Washington, DC, and the other in the Beirut Souks in Lebanon, a public outdoor gathering place and shopping area.

These workshops were directly connected to a principal development aim of the project: ensuring engagement with both the host population and refugee community and targeting women. Bringing these populations into the same physical space with a shared goal was a strategy to achieve the development aim of social interaction and engagement on an empathetic and emotional level.

The Children and Youth Development Project in North Macedonia

Youth Development and Enrichment

In the late 1990s, development research showcased wide ethnic differences in North Macedonia, revealing the region’s vulnerability to social tensions which could directly thwart sustainable development. The research also indicated that the differences manifested themselves in imbalances of economic and social success across cultural groups, with the youth population most at risk.

In June 2001, the number of children in the region with delinquent behavior was almost double that of five years prior. In that same period, the number of identified substance users increased fourfold and the number of criminal acts by juveniles increased by 50%. Additionally, the percentage of students in school from various ethnic groups did not mirror their percentage in the total population, especially among girls. For example, girls in North Macedonia represented just over half (50.6%) of secondary-school-age children at the time, but only 37.3% of Albanian girls within this age group appeared on the official school registration lists. The corresponding figures for Turk and Roma girls were even lower, at 33.5% and 32.5%, respectively (World Bank, n.d.).

To address this, the North Macedonia Agency of Youth and Sport developed a series of programs housed within their Youth Centers—spaces for after-school enrichment activities—aimed at systematically engaging young people in life education activities. These activities included sports, computer and IT training, English language acquisition, art, music, drama, journalism, and debate techniques. The WBG provided financial support and capacity-building expertise to expand the available services.

The goal was to scale up the innovative programs offered by the Youth Centers for vulnerable youth, make these programs sustainable, involve communities in supporting their resource development, and ensure that the policy surrounding the programs continued to reflect the grassroots needs of the community.

Arts-Informed Economic Intervention

The arts-based intervention for this project was the development of creative activities as part of the Youth Center curriculum.

Motivating Factors for Using an Arts-Informed Intervention

Institutional value-add

The WBG’s larger strategic framework for the country included a focus on social protection activities and human capital growth. Engaging youth in enrichment and personal development activities which featured art programming was seen as directly aiding the attainment of positive social outcomes and the ability of the World Bank to deliver on its country-wide strategy (World Bank n.d.).

Precedent

The WBG had previous experience in projects that offered creative enrichment activities through youth centers. Offered over a longer time horizon, these projects demonstrated that ongoing enrichment programs decrease in cost over time. At the same time, their reach expands, spurring an identifiable process of cultural change in perceptions of self, increased feelings of empowerment, less drug abuse, and greater numbers of employable youth across all ethnic groups.

At the time of this project, the Youth Centers were the only available public program addressing life education for youth in North Macedonia. The arts were seen as a crucial part of the centers’ larger package of activities designed to promote conflict resolution and lessen multiethnic tensions.

In 2001, each Youth Center cost an average of US\$23,000 per year, with the cost per student for one year of activities at US\$53. Because of WBG’s successful experience with similar projects in the region, the cost per beneficiary was reliably expected to decrease to US\$34 by 2005 while the number of beneficiaries was expected to double over the life of the project, reflecting increased outreach, inclusion of rural areas, and greater cost effectiveness. The WBG also used qualitative surveys to measure positive changes in widespread perceptions of minority groups and social cohesion.

Rohingya Refugees in Bangladesh

Improving the Lives of Adolescent Refugees

In August 2017, more than 750,000 Rohingya fled Rakhine State in Myanmar for neighboring Bangladesh to escape a genocidal campaign led by the Myanmar military. Before leaving, many witnessed their homes destroyed, their land burned, and their families murdered. Few were able to bring their belongings with them. Yet countless Rohingya refugees yearn to return, as one young man showcased with his poignant comment about the irreplaceable nature of being home: “Don’t you know what home is? Home is heaven.” But the longing to return home sits alongside the difficult reality that safe repatriation appears unlikely; as such these refugees may spend the near, and potentially far, future within Bangladesh.

Anthropological work makes clear that building a sense of home, whether manifested through security and stability or identity and tradition, plays an enormous role in refugees’ well-being. Yet current economic policymaking around migration, which focuses on the physical, material, and social trade-offs between a migrant’s origin and destination countries, misses the profound psychosocial role of the cultivation of a “home.” The WBG’s ongoing research *A Home away from Home: Improving the Lives of Adolescent Refugees*, by Erin Kelley, Gregory Lane, Reshma Hussam and Fatima Zahra, will speak directly to this gap.

This project will compare the impact of three programs. One is the traditional youth enrichment program offered by Terre des Hommes (TDH), an internationally renowned organization that works exclusively with children facing vulnerable situations. The other two programs combine this preexisting

program with either a photography module designed to help adolescents build a sense of home in their camp or a photography module intended to provide adolescents with marketing skills so that they can offer their photography services to nongovernmental organizations (NGOs) working in the camp.

Surveys will be strategically designed to capture changes in mental health and conducted in multiple rounds to measure the perceptions of home and the host community, feelings of hope, child protection and stability, perceptions of the future, time preferences/ time use, and emotional well-being. The surveys will be implemented with two partners: Innovations for Poverty Action Bangladesh (IPA-B, the largest survey firm operating in the country’s refugee camps) and ICDDR,B (the largest institution in Bangladesh studying issue of mental health across the country). The baseline survey will be collected by Terre des Hommes. The second survey will take place after the first six weeks to measure the short-term effect of the traditional TDH program in isolation. The third survey will take place after the final six weeks of the program in order to estimate the impact of adding a photography module centered around home compared to the module focused more heavily on building human capital (employable skills).

Arts-Informed Intervention

A Home away from Home: Improving the Lives of Adolescent Refugees analyzes the act of learning an artistic skill—photography—to understand the

difference in its psychosocial benefits when it is used to create a sense of “home” in a camp compared to creating economic changes by providing marketable skills to local refugees. In this case, the arts-informed intervention is the use of a creative activity to quantify the cost of psychosocial changes among refugee populations.

Motivating Factors for Using an Arts-Informed Intervention

This research contributes to the World Bank’s goal of promoting better living conditions for refugees, who represent an unprecedented 70 million people in recent years. This work also addresses a significant gap in current economic policymaking around migration, which focuses on the physical, material, and social tradeoffs between a migrant’s origin and destination countries but entirely misses the profound psychosocial role of the cultivation of a “home.”

Photography was selected as the tool for the study because it is both an art form that can yield better emotional awareness and health and a marketable skill that can yield economic benefits. It is uniquely suited

Innovation

This research is intended to help policymakers and governments understand the importance of helping adolescent refugees create a sense of home in the camps, a factor largely ignored in the ongoing initiatives to provide aid to refugees.

Policy implications

This research will show the psychological costs of losing one’s home, capturing how this cost should influence the migration development models that have been developed to date.

to sharpen understandings of how the development of emotional well-being compares to the development of economically marketable skills for a refugee population, and to clarify which one might better serve the needs of displaced people.

**This research is ongoing with an estimated completion in Spring 2021.*



Rohingya women with kids are walking to the camp with relief food. Near Block D5, Kutupalong extension Camp, Cox's Bazar, Bangladesh. 2 July 2018. Photo: Tanvir Murad Topu / World Bank.

Venezuelan Refugees in Colombia

Improving Mental Health and School Integration

The Venezuelan migrant crisis is the third-largest migration flow globally and the worst that Latin America has ever experienced. Over five million Venezuelans—equivalent to 16% of the population—have been displaced from their country by the current economic and political crisis. The largest number of displaced Venezuelans—around 1.6 million, according to official estimates—have settled in neighboring Colombia, which has received more displaced children than any other country in the world. Among the most pressing needs of Venezuelan refugee households upon arrival to Colombia are work permits, schooling for their children, and basic medical care.

Children are among the most vulnerable groups of refugees, and the emotional well-being of Venezuelan refugee children is currently of great concern for the international community and Colombia itself. This makes the country an important setting within which to study the effect of interventions designed to promote the integration and well-being of children, and their capacity to build both cognitive and soft skills.

Bullying, social tension, and discrimination by peers create a disruptive environment at school, threatening the capacity of young people to accumulate human capital, with long-lasting consequences for productivity and well-being. However, the school setting also has the potential to create a sense of normality and stability in the lives of displaced children, especially when accompanied by psychosocial support. Quality education plays an important part in encouraging integration and social inclusion among children.

WBG’s research *Mental Health, School Integration, and Refugees in Colombia*, conducted by Lelys Dinarte, Sandra Rozo, and Juan Vargas, will study the effects on Venezuelan refugee children of Somos una sola escuela, a program that uses an arts-based curriculum to help children identify and explore their emotional well-being. The program will be implemented within schools hosting much of the refugee population.

This research will compare the mental health, prosocial behavior, school cohesion, and educational outcomes of a control group against three other groups: students who only experienced an art therapy intervention, students who only experienced a social cohesion curriculum, and students who experienced both. For mental health, measures of arousal (as a proxy for stress) and valence (as a proxy for emotional regulation) will be taken using low-cost electroencephalograms. For prosocial behavior, self-reported questionnaires and task-based surveys will be used to measure levels of empathy. Finally, administrative sources will provide measures of educational outcomes, school attendance, standardized test performance, and dropout levels.

Arts-Informed Intervention

In this research the arts-informed intervention is the program Somos una sola escuela. This program will feature two key components: an arts therapy-based intervention and a social cohesion-oriented school curriculum. The art therapy component will use artistic

methods to help people explore their emotions, cope with stress, and boost self-esteem and social skills. Researchers will work with art therapists to develop a curriculum that addresses the ability of participants to build a bridge between the past and the future by attaching meaning to experiences, an important facet of social protection. This curriculum will use storytelling and drawing to help children reconcile their two cultural worlds, express feelings of loss, and share coping strategies to create ripple effects of positive social change.

The social cohesion curricula that would be a part of this study will be oriented to promote diversity and challenge prejudices. This curriculum will promote openness to different perspectives and encourage critical thinking through role playing. This part of the program will rely heavily on theater activities that allow children to place themselves into the lives of migrants, fostering a sense of empathy between migrants and Colombian children. The program will be designed for a heterogeneous classroom setting using characters and roles that are particular to the Venezuelan and Colombian contexts.

Motivating Factors for Using an Arts-Informed Intervention

Innovation	Policy implications
This project will greatly contribute to the existing literature on interventions oriented toward improving displaced children’s emotional health and well-being.	This project has the potential to change the kind of curriculums mandated for use in schools that house refugee populations.

Developmental research has established that violence negatively impacts educational success, regional stability, and economic growth. Research also points to direct relationship between levels of violence and size of refugee populations. To mitigate these realities, development professionals have focused their interventions upstream: engaging a young population to develop enduring positive social behaviors and emotional control.

This research will fill a gap in existing psychological evidence. While some studies show positive effects of art therapy on outcomes among immigrant children, they are typically based only on small samples or lack a credible control group. This research will overcome those issues by implementing a large-scale program assessed by a randomized control trial. As well, to the best of the researchers’ knowledge, there is no evidence of programs that simultaneously focus an intervention on displaced children and the contexts in which they interact. This research thus expands the field by clarifying how the content and location of arts-based curricula impact their success in developing prosocial behaviors. Finally, this research focuses on the impact of arts curricula in developing countries, a departure from research that is generally conducted in developed countries.

The researchers hypothesize that this therapy will primarily help displaced Venezuelan children to cope with their displacement trauma and potentially indirectly improve Colombian children’s mental health as well. If confirmed, the intent is to use art therapy and social cohesion curricula more widely in school settings to diminish the harm of social tensions and develop resilient young people better able to develop their full human capital.

* This research is in the proposal phase as of Summer 2020

Violence Mitigation in El Salvador

Behavioral and Neurophysiological Evidence for Preventing Violence

Violence and crime in the developing world force countries to spend substantial amounts of public and private resources on reducing their adverse effects, causing critical welfare losses. Across all stages of childhood and adolescence, young people in developing countries have particularly high exposure to violence and crime. For example, 43% of all homicides worldwide occur between ages 10 and 29, and nearly all these deaths occur in developing countries (World Health Organization 2016). In addition to direct economic and social costs, evidence shows that this early exposure makes this population more likely to be involved in crimes later in life (Sousa et al. 2011; Damm & Dustmann 2014).

After-school programs have been identified as tools that protect children by preventing victimization and delinquent behavior. When including a special curriculum to foster socioemotional skills, these programs can also be an alternative source of learning and social development.

Arts-Informed Intervention

WBG’s research *Preventing Violence in the Most Violent Contexts: Behavioral and Neurophysiological Evidence*, conducted by Lelys Dinarte and Pablo Egana-delSol, provides experimental evidence of the impact of an after-school program on vulnerable public school students in El Salvador. The program combined a

cognitive behavioral therapy intervention with a more traditional after-school program of ludic activities (i.e., social interactions based on games and play, including arts-based activities) for students ages 10 to 16. The authors hypothesized that it would affect violence, misbehavior, and academic outcomes by modulating emotional regulation and automatic reactions to external stimuli. The arts-informed intervention was chosen to study the impact of after-school programs that included creative and artistic activities.

Results

The impact of the after-school program and cognitive behavioral therapy curricula was measured through surveys and portable electroencephalograms. Before the children attended the blended program, self-reported data on personal and family characteristics were collected from the students. Follow-up self-reported data included questions to measure the intervention’s impact on attitudes, violence and crime, exposure to risky spaces, and educational or personal expectations. This self-reported information was combined with administrative records on math, reading, and science grades, behavioral reports, and absenteeism data. Schools provided this data before and after the intervention both for students who were enrolled in the program and those who were not. Additionally, neurophysiological evidence was collected

from a random subsample of students who had been enrolled in the program, with emotional regulation and stress proxied directly from their brain activity. Portable electroencephalograms were used to take measurements at a lab-in-the-field setting.

The research found that students assigned to the program had better attitudes toward school and 23 percent less absenteeism. It also showed reduced violence and misbehavior at school, based on reports from students and teachers. In line with evidence that emotional and behavioral skills promote and indirectly influence cognitive development (Cook, Ludwig, & McCrary 2011; Cunha & Heckman 2008), the researchers also found that the cognitive behavioral therapy curriculum blended with the after-school program successfully increased academic achievement, with grades 0.11–0.13 standard deviations higher for treated students after seven months of intervention. The intervention also reduced the probability of having to repeat a course by 2.8 percentage points.

The program also had indirect short-term effects on children who were not enrolled. Exploiting the exogenous percentage of treated students within each classroom, the research found positive spillover effects where nonenrolled students were exposed to a higher proportion of treated classmates in terms of both academic and behavioral indicators. The magnitudes of these effects were 0.08–0.09 standard deviations on academic performance and 0.15 standard deviations on misbehaviors at school.

Motivating Factors for Using an Arts-Informed Intervention

Innovation

This research filled a gap in the literature that examines the impact of after-school programs on youth development in developing countries.

Economic implications

This research develops a clear connection between the emotional well-being of those exposed to violence and their eventual economic earning power.

After-school programs have long been established as tool for social behavioral improvements. However, prior to this study, the literature focused mainly on the effects of the programs in developed countries, primarily the United States, a context that generally has limited applicability for low- and middle-income countries. Here, the research concluded that the blended cognitive behavioral therapy and after-school program was a low-intensity intervention that could be successfully applied in the context

of a developing and highly violent country, with short-term effects similar in magnitudes to those of middle-intensity interventions in the United States (Durlak, Weissberg, & Pachan 2010; Cook, Gottfredson, & Na 2010).

Given that emotions regulate many cognitive and behavioral outcomes, such as attention, memory, and perception (Salzman & Fusi 2010), there is evidence that they may also impact earning power. Individuals exposed to highly risky environments might demonstrate more substantial effects, compared to their less exposed peers in terms of learning and developing cognitive and socioemotional skills. This, in turn, creates or widens a gap in educational or labor market outcomes.

** This research is a Policy Working Paper published in May 2019 as part of the Development Economics, Development Research Group of the World Bank Group (Dinarte-Diaz and Egana-delSol 2019).*

The Art of Resilience

Reshaping Global Climate Change and Risk Communications

The Global Facility for Disaster Risk and Reduction (GFDRR) is a WBG-managed grant-funding mechanism that supports disaster risk management projects worldwide. Working on the ground with more than 400 local, national, regional, and international partners, GFDRR provides knowledge, funding, and technical assistance.

Through its project work, GFDRR identified the need to more effectively communicate the urgency of climate change. The complexity of climate change data, and the information associated with understanding monumental environmental changes, make it difficult to communicate in ways that elicit behavioral change, especially in an era of rampant misinformation and sensationalism. In an innovative approach, GFDRR embarked on a climate risk communication campaign built on an international arts exhibition that featured visual designers and technologists. Alongside the exhibition, GFDRR created a database of publicly accessible artists working on related topics, bringing the importance of creative-sector collaborations to broader audiences.

This campaign aimed to achieve three goals:

- Showcase through practical examples the potential for art to support the aims of disaster risk management and climate change communications.
- Inspire climate change leaders within the World Bank to incorporate art into their projects, especially when they are sharing their findings with professionals who do not work in the development area.

- Contribute to the knowledge and awareness of the wider set of WBG staff working on climate change topics about the linkages across art, design, science, and resilience (Global Facility for Disaster Risk and Reduction and World Bank 2019a).

Much of this project was designed to raise awareness of art’s usefulness as a tool to communicate big climate change data. Success was measured by the backing of senior World Bank management staff, by the total number of World Bank staff who attended the educational events associated with the exhibition, and by the indication of future funding for initiatives that included engaging with artists at the nexus of art and climate change.

Arts-Based Intervention

Here, the arts-based intervention was the project itself—an exhibition that brought together international artists working at the intersection of visual art, data, science, and climate change to present new ways of communicating climate data and the urgency of action. The belief was that by collaborating with creative sectors, the data-driven narratives of development professionals could be more deeply felt and understood by a broader audience.



Redefining Life, Pitsho Mafolo, 2019. Mixed media on paper, 186 x 166cm. Image courtesy of the artist.

Motivating Factors for Using an Arts-Informed Intervention

Institutional value-add	Alignment	Readily available arts expertise
The upper levels of management within GFDRR recognized the challenge of engaging broad audiences with their research and committed to dedicating time and resources to experimenting with new solutions.	GFDRR, the unit within the WBG that took on this project, maintains an Innovation Lab charged with trying new approaches to climate-change-related development challenges.	Through the institutional partnership with the World Bank Art Program, GFDRR was able to access needed curatorial expertise and artistic program management at no cost.

This project arose in response to GFDRR’s recognition that they could be more effective in their communications about climate change data to the general public. To inspire higher levels of engagement with its research findings and improve the impact of its work, GFDRR sought to modify the ways in which it crafted its narratives.

Additionally, this arts-based intervention dovetailed with the structure of GFDRR’s Innovation Lab—a unit dedicated specifically to pushing the envelope with development projects that are traditionally seen as too risky or experimental. As a department, GFDRR had the bandwidth to undertake a new approach that could be rigorously tested.

The WBG Art Program was a ready partner, willing to manage all of the technical art aspects of the project at no cost, including curating the works, identifying strong artists, organizing all shipments, confirming legal agreements with the makers, and publishing all exhibition labels and catalogue. Because GFDRR had neither the in-house expertise to manage the artistic side of the project nor the budget to hire a consultant to do so, the partnership with the Art Program’s staff was a linchpin in making this arts-informed intervention feasible.

Looking Ahead

Arts-informed economic interventions in WBG project and research work are used for intentional and strategic reasons. Within a project, arts-informed interventions were implemented when key motivating factors were present. For example, it was important to be able to show how the outcomes of the arts intervention allowed the larger project to meet its benchmarks for success in cross-cutting development themes, such as greater engagement with women or increased social opportunities for ethnic minorities. Arts-informed interventions were used when the WBG could identify reliable partners and collaborators with skills and expertise that were beyond WBG's capacity.

Additionally, arts-informed interventions were used when the failure of other methods established an undeniable need to try something different. Such was the case in the Art of Resilience climate change project and the Lebanon Municipal Services Emergency Project, where arts served as an innovation that could break the mold. Finally, the World Bank supported research into arts-informed interventions when the interventions held reasonable promise of revealing new approaches to development challenges, had positive policy implications, or filled a gap in existing literature. Across all projects and research, the arts-informed interventions always showcased links back to building human capital as the gateway to economic growth.

As the Human Capital Project continues, the



Two students in a rural school in Mongolia are making a story book together, based on the stories they read in the classroom library. Dadal County, Mongolia. Photo: Khasar Sandag / World Bank

opportunity to further mainstream arts-informed interventions will depend on the continued development of analytic tools that concretely connect the outcomes of arts-informed interventions to greater individual productivity and resilience. As the case studies demonstrate, the tangible changes that confirm improvements in individual productivity and resilience can take many forms, ranging from increased employment to controlled emotional responses and higher pickup rates of municipal services. It will be the job of development professionals to open their minds to the ability of the arts to foster socioemotional well-being and therefore economic capability, developing metrics that link the results of this process to the growth of human capital.

MATRIX

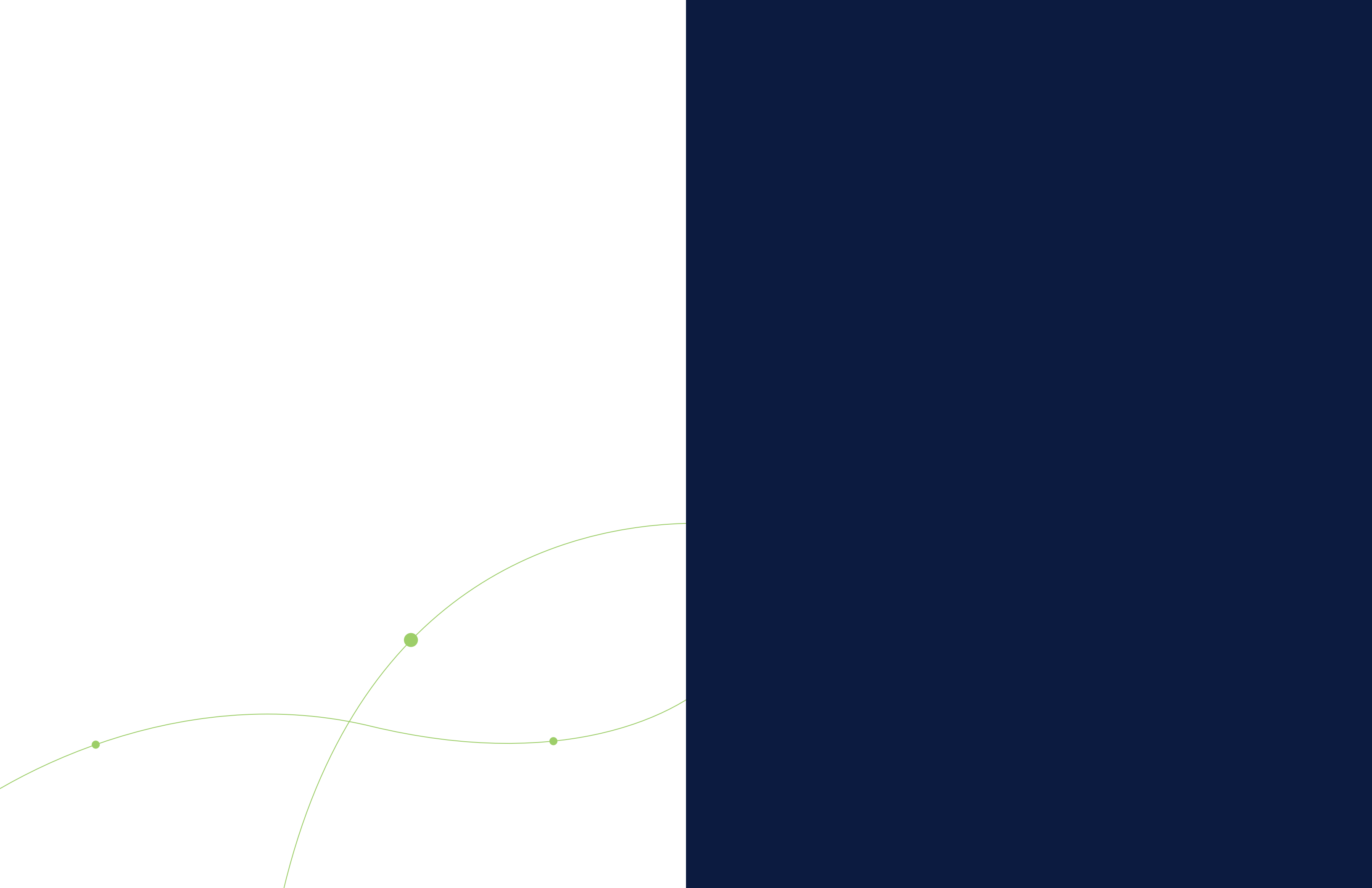
Motivation for Arts-Informed Intervention

Case Studies

Motivating Factors for the Use of an Arts-Informed Intervention	The Afghanistan Skills Development Project	Lebanon Municipal Services Emergency Project	The Children and Youth Development Project in North Macedonia	Rohingya Refugees in Bangladesh	Venezuelan Refugees in Colombia	Violence Mitigation in El Salvador	The Art of Resilience
Precedent			✓				
Institutional value-add			✓				✓
Alignment	✓	✓					✓
Measurability	✓						
Readily available arts expertise		✓					✓
Unexpected need for out-of-the-box thinking		✓					
Policy implications				✓	✓		
Innovation				✓	✓	✓	
Economic implications						✓	

References

- Cook, P., Gottfredson, D., & Na, C. (2010). School crime control and prevention. *Crime and Justice*, 39, no. 1: 313–440.
- Cook, P., Ludwig, J., & McCrary, J. (eds.). (2011). *Controlling crime*. Chicago: University of Chicago Press.
- Cunha, F., & Heckman, J. (2008). Formulating, identifying, and estimating the technology of cognitive and non-cognitive skill formation. *Journal of Human Resources*, 43, no. 4: 738–82.
- Damm, A., & Dustmann, C. (2014). Does growing up in a high-crime neighborhood affect youth criminal behavior? *The American Economic Review*, 104, no. 6: 1806–32.
- Dinarte-Diaz, L., & Egana-delSol, P. (2019, May 23). Preventing violence in the most violent contexts: Behavioral and neurophysiological evidence. World Bank Policy Research Working Paper 8862, Washington, DC. Retrieved from <http://documents.worldbank.org/curated/en/863301558616166819/Preventing-Violence-in-the-Most-Violent-Contexts-Behavioral-and-Neurophysiological-Evidence>
- Durlak, J., Weissberg, R., & Pachan, M. (2010). A meta-analysis of after-school programs that seek to promote personal and social skills in children and adolescents. *American Journal of Community Psychology*, 45, nos. 3–4: 294–309.
- Global Facility for Disaster Risk and Reduction and the World Bank. (2019a). The art of resilience. Retrieved November 18, 2020, from <https://www.artofresilience.art/about/>
- Global Facility for Disaster Risk and Reduction and the World Bank. (2019b). *The Tempest Project*. Retrieved November 18, 2020, from <https://www.artofresilience.art/gallery/whidbey-island-nas/>
- Horton, S., & Steckel, R. (2011). Global economic losses attributable to malnutrition 1900–2000 and projections to 2050. Copenhagen Consensus on Human Challenges, Assessment Paper: Malnutrition. Tewksbury, MA.
- IHME (Institute for Health Metrics and Evaluation). (n.d.). Global burden of disease (GBD). University of Washington, Seattle. Retrieved November 18, 2020, from <http://www.healthdata.org/gbd>
- Keralis, Henry R. (2020, March 8). Small but steady steps to empower women in Afghanistan. *World Bank Blogs*. <https://blogs.worldbank.org/endpovertyinsouthasia/small-steady-steps-empower-women-afghanistan>
- Kraay, A. (2018). Methodology for a World Bank Human Capital Index. World Bank Policy Research Working Paper 8593, Washington, DC.
- Montenegro, C., & Patrinos, H. (2014). Comparable estimates of returns to schooling around the world. World Bank Policy Research Working Paper 7020, Washington, DC.
- Salzman, C., & Fusi, S. (2010). Emotion, cognition, and mental state representation in amygdala and prefrontal cortex. *Annual Review of Neuroscience*, 33: 173–202.
- Sousa, C., Herrenkohl, T., Moylan, C., Tajima, E., Klika, J., Herrenkohl, R., & Russo, M. (2011). Longitudinal study on the effects of child abuse and children's exposure to domestic violence, parent-child attachments, and antisocial behavior in adolescence. *Journal of Interpersonal Violence*, 26, no. 1: 111–36.
- Stuckey, H., & Nobel, J. (2010). The connection between art, healing, and public health: A review of current literature. *American Journal of Public Health*, 100, no. 2: 254–63. Retrieved from doi:10.2105/AJPH.2008.156497
- Weil, D. (2007). Accounting for the effect of health on economic growth. *Quarterly Journal of Economics*, 122, no. 3: 1265–306.
- World Bank. (2015a, March 25). Music institute plays vital role in rebuilding society. Retrieved from <https://www.worldbank.org/en/news/feature/2015/03/25/music-institute-plays-vital-role-rebuilding-society>
- World Bank. (2015b, September 1). Girls find their place in Afghanistan's music institute. Retrieved from <https://www.worldbank.org/en/news/feature/2015/09/01/girls-find-place-afghanistan-music-institute>
- World Bank. (2016a, July 14). Helping Lebanese communities cope with Syrian refugees. Retrieved from <https://www.worldbank.org/en/news/feature/2016/07/14/helping-lebanese-communities-cope-with-syrian-refugees>
- World Bank. (2016b, June 14). Music transforms lives of disadvantaged youth in Afghanistan. Retrieved from <https://www.worldbank.org/en/news/feature/2016/06/14/music-transforms-lives-of-disadvantaged-youth-in-afghanistan>
- World Bank. (2017, November 2). Butterfly exhibition: Promoting peace through arts. YouTube, 9:04. Retrieved from <https://www.youtube.com/watch?v=auxGO2fEBnw>
- World Bank. (2018a). The Human Capital Project. Retrieved November 17, 2020, from <https://openknowledge.worldbank.org/bitstream/handle/10986/30498/33252.pdf?sequence=5&isAllowed=y>
- World Bank. (2018b, June 28). World Bank announces support for Bangladesh to help Rohingya. Press release. Retrieved from <https://www.worldbank.org/en/news/press-release/2018/06/28/world-bank-announces-support-for-bangladesh-to-help-rohingya>
- World Bank. (2018c, December 17). Implementation completion and results report (TF17510) on a Lebanon Syria crisis trust fund grant in the amount of US\$10 million to the Republic of Lebanon for the Lebanon Municipal Services Emergency Project. Retrieved from <http://documents.worldbank.org/curated/en/306681546027934957/pdf/icr00004600-12192018-636810265727354070.pdf>
- World Bank. (2019, April 11). World Bank launches human capital plan to propel investment in Africa's people. Press release. Retrieved from <https://www.worldbank.org/en/news/press-release/2019/04/11/world-bank-launches-human-capital-plan-to-propel-investment-in-africas-people>
- World Bank. (n.d.). Children & Youth Development Project. Retrieved November 18, 2020, from <https://projects.worldbank.org/en/projects-operations/project-detail/P073483?lang=en>
- World Health Organization. (2016). *World health statistics 2016: Monitoring health for the SDGs Sustainable Development Goals*. Geneva.



The background is a deep blue with a subtle, organic texture. Two thin, white, curved lines sweep across the frame. One line starts from the left edge, curves upwards, and ends near the top right, with a small white dot marking its endpoint. The other line starts from the left edge, curves downwards, and ends near the bottom right, with a small white dot marking its endpoint. These two lines intersect in the lower-left quadrant, with a small white dot at the intersection point.

NeuroArts Blueprint

Advancing the Science of Arts, Health, and Wellbeing