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Beyond Hat in Hand: Science Advocacy Is Foundational for Policy Decisions

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Beyond those to whom neuroscientists typically communicate exciting discoveries—that is, those who can provide more funding for researchers—there are important audiences that are positioned to use neuroscience findings to affect policy and improve societal outcomes. Showing the utility of research that policymakers, service providers, and the public can use to make decisions will enhance views of the value of scientific research. The ingredients of successful communications between neuroscientists and other stakeholders are different from those that characterize effective communications between scientists. Here, we discuss our experiences in the communication of the science of early childhood and brain development and our recommendations to help neuroscientists better communicate the benefits of their research to those who make practice and policy decisions.

Introduction

There is no need to convince the readers of *Neuron* that science matters and that research can shape reality. However, a perception is taking hold among non-scientists that research findings are capricious, uncertain, and of little value to those who make decisions about policy and practice—decisions that will affect all of us for generations (Aschwanden, 2016; The Economist, 2013). There are long-standing debates in the neuroscientific community about reproducibility and the inherent problems posed by biological systems. These are discussions that we hold among ourselves and that are meant to spur critical thinking about improving the scientific process (Ioannidis, 2014; Landis et al., 2012; Pike, 1933). Here, however, we focus on efforts by neuroscientists to reach beyond their peers—to policymakers, service providers, and members of the public. Most science communications activities typically focus on education (such as promoting cognitive and neuroscientific research during Brain Awareness Week); fixing nervous system-based diseases (through, for example, patient and scientist advocacy); institutional and self-promotion of discoveries (via outreach to the lay press); and advocating for more financial support of research (via outreach to governments and foundations). Our professional societies promote these activities, and they are worthy of continued effort. Yet, there is an enormous gap between what we *know* about the power of neuroscience to spark substantive societal change and what we *do* with neuroscience research to inform policymakers, practitioners, and members of the public. The responsibility for addressing this gap falls to two groups of experts: those who conduct the science and those who work on communicating it. The experts who comprise these groups typically do not overlap; indeed, they have few opportunities to meet, interact, and work with each other. Yet, both groups rely on the same research findings to advance and apply knowledge. When these two groups work together, they are better able to improve policy and social outcomes. We share our collective experience and expertise in the science of child and brain development and in the science of communications to stimulate more action in science-informed policy-making. The rationale for ramping up these activities has been well articulated in recent commentaries (Holt, 2017; Stokstad, 2017) and declarations (Kazatchkine et al., 2017) and by our colleagues (Shonkoff and Bales, 2011).

The Partners

Who is in the best position to influence policy outcomes? One key group comprises the elected officials who are responsible for enacting and implementing programs that impact health, education, and quality of life. Policymakers at the local, state, and federal levels make influential decisions on an almost daily basis. But influencing policy requires reaching beyond this group. We must include others who can influence decisions, such as business leaders, service providers in health, education, and human welfare, advocates, and, importantly, members of the public. Effective science communications can create new partnerships among members of these disparate groups and advance science's ability to enrich and improve the quality of life for all people.

Science identifies core causal processes in an effort to improve outcomes. But scientists also need to engage in research that sheds light on the solutions that are effective in addressing these causal processes and point stakeholders to specific solutions approaches. The effectiveness of specific solutions depends on the unique characteristics of a given community. Equally salient in affecting positive change are the cultural values that impact belief systems, the available resources in a given community

to drive change, the presence of scientists who can communicate the essential features of an issue that needs to be addressed, and the factors that create effective solutions. Thus, in addition to asking for more money to support our work, scientists need to cultivate a greater recognition of the value of science and encourage its use in advancing societal benefits. The good news is that we don't have to guess how to do this. We can use science.

An Interdisciplinary Approach

We have a successful track record in approaching this problem in an interdisciplinary fashion. Neuroscience is, by definition, a discipline that reflects the very best of interdisciplinary collaboration. In 2003, the National Scientific Council on the Developing Child (NSCDC) and the FrameWorks Institute, a multidisciplinary team of social scientists, took a unique approach to science translation and mobilization that drew on both the science of child and brain development and the science of communication (Shonkoff, 2014, 2016). For nearly two decades, we have been working to translate the science of early childhood development to inform policy and practice. This work has shown that by using careful and evidence-based communications, science *can* influence policy by orienting stakeholders to the powerful effect of early experience on lifelong health, education, and productivity. In the process of communicating this science, we have found that it is essential to avoid overreach. That is, we learned to accept the reality that the way we use science to develop programs and solutions will vary depending on the context in which it is being used and the problems that are being addressed.

Learning how to successfully communicate complex neuroscience is not simple. It turns out that simply using shorter sentences and smaller words does not work. Scientists tend to modify statements of fact, using phrases like "may show," "perhaps meaning," or "could be." These terms diminish the confidence that non-scientists have in the certainty or even the validity of what they are hearing. The NSCDC was founded to bring together the best, most robust evidence (that is, to determine what is and what is not "ready for prime time") from developmental neuroscience, psychology, health, and economics and to make this knowledge available to those who make decisions about programs targeting early brain and child development.

The council was put together by Jack Shonkoff (director of the Center on the Developing Child at Harvard University). It emerged from his experiences as a member of the MacArthur Research Network on Early Experience and Brain Development and as co-chair of a National Academy of Science advisory board that assembled a National Research Council and Institute of Medicine book on the topic of the science of early childhood development (Phillips and Shonkoff, 2000). Since its inception, council members have actively researched developmental neuroscience and plasticity, developmental psychology, neuroendocrinology, pediatrics, immunology, and economics.

Early on, the council established a set of working principles, which have been key to its success. First, members collaborate, without individual credit, to develop open-access products (such as working papers, briefs, and videos; http://developingchild.harvard.edu/) to translate the science of child and brain development for non-experts. All information is designed for non-scientists, but the council's communications strategy targets policymakers, and particularly those at the state level. The rationale is that state-level policymakers have more freedom to shape policy than their federal counterparts.

Another important principle is to not rely solely on literature reviews. Instead, the council invites outside experts to educate members and participate in discussions about communications challenges and strategies. A third important principle: the council does not venture into topics that are far beyond its members' collective expertise or on which scientific consensus is thin or tenuous. For example, the council was on solid ground in conceptualizing the policy implications of early childhood and brain science, but it stopped short of recommending specific programs to policymakers. Harvard's Center on the Developing Child assembled other groups, such as the National Forum on Early Childhood Policy and Programs, to evaluate the effectiveness of intervention programs. Council members have expertise in neuroscience and child development and stick to their mission: to communicate the science behind why early experience, good or bad, has such a profound effect on brain development, lifelong mental and physical health, and quality of life outcomes (Shonkoff and Levitt, 2010).

Finally, council members decided early on to prioritize communications. As a result, council members engaged social scientists at FrameWorks at and between meetings. FrameWorks researchers provided qualitative and quantitative research findings about the effectiveness (and ineffectiveness) of specific framing strategies in communicating the core principles of developmental neuroscience and child development to policymakers and the public. In other words, most scientists, even though they may have the best of intentions, will, when left to their own devices, unintentionally feed into myths and cultural beliefs about early childhood that halt the conversation, often before it even gets going, about how to use science findings in the policy arena.

Telling a Science Story

Humans think in stories. The well-known studies of psychologists Fritz Heider and Marianne Simmel (Heider and Simmel, 1944) reflect this fundamental feature of cognition. We also know that science can help us better understand how the world works and how to improve individual and societal outcomes. At a time when ideology divides the country and politics polarizes the population, there is an even greater need to tell science stories. Science transcends ideology and identity politics and focuses people's attention on issues, their causes and consequences, and solutions.

Whether in agreement with a particular policy or not, it is clear that public policies structure society. Policies determine who gets resources and who doesn't; which issues get addressed and which don't; and which approaches to improving social wellbeing are employed and which are eschewed. In a working democracy, public will shapes policy; it creates room for and puts pressure on decision makers to make certain choices. Public understanding of social problems, and support for solutions to them, is shaped by the

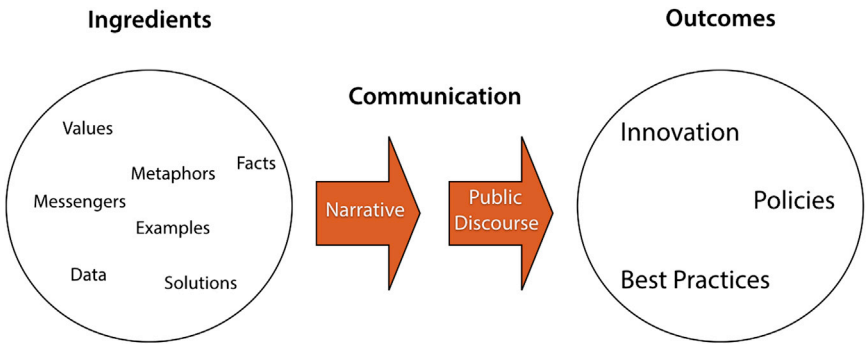

Figure 1. Components of Effective Science Communication
A summary of the key ingredients to use in developing an understandable and accessible neuroscience-based narrative that can be used to engage policy makers and move the public discourse forward on key issues. This can lead to innovative solutions, evidence-based practices, and, ultimately, new and more effective public policies.

way that these problems are framed—how information about them is presented and contextualized over time in the public discourse. This is a critical concept regarding communicating science. Policy decisions are driven by ways that science frames intersect with cultural beliefs and values.

The study of social movements, whether for civil rights, marriage equality, tobacco control, or healthy child development, shows that frames play a powerful role in building public will, increasing support for solutions, and fomenting engagement—all the ingredients for deep and lasting social change (Benford and Snow, 2000; McAdam et al., 1996) A growing body of research shows that frames affect people's understanding of social issues and their support for solutions (Benford and Snow, 2000). In addition to this growing body of evidence, an increasing number of examples illustrate the role and importance of framing in creating social change. The movement for marriage equality (Nix, 2015) offers one recent example. Advocates initially positioned this issue as a way to grant the LGBT community the legal right to marry. When this frame failed to move the issue, advocates reframed it in terms of love and commitment—and gained ground. The movement for marriage equality was, of course, a complex and long-term advocacy effort. But the powerful effect of this reframe is now well accepted. We have witnessed the power of framing in our own field. Initially, the public discussion about programs to support early childhood development centered on the vulnerability of children. The council, with guidance from FrameWorks, reframed the debate around the value of future prosperity—the idea that society will prosper in the future if children's development is supported today. We believe this reframe is one reason behind the growing investments in early childhood development programs in many states. Reframing this important issue—by abandoning a moral appeal to protect vulnerable children and adopting a new one about boosting future prosperity—has proven effective.

Employing science to explain how development happens and what factors threaten it was another key part of effectively reframing to boost support for solutions. The communications roadblocks were numerous. They include the "Family Bubble" (the widespread belief that children's outcomes are determined almost exclusively by parents), which halts conversations about broader community and policymaker responsibilities for child outcomes; the uniquely American concept of "Rugged Individualism," which impacts how to communicate the science of resilience (that is, if individuals are either strong or weak, how can they become more resilient?); and a view of children as either "good" or "bad" seeds, which feeds a deterministic concept of development and a malignant sense of fatalism around solutions.

Explanation is a key part of framing. Scientists need skills to effectively explain their work and how it can be used to better understand social issues and innovate new solutions to society's most challenging problems. In this way, science translation is an essential part of a healthy democracy; it helps the public understand social problems and analyze proposed solutions. The explanatory power of science, communicated via effective frames, can rise above political arguments and seed a healthier debate about how to best use policy and programs to address social problems. An important caveat: not any type of explanation will do.

Explaining research findings in the way that scientists do to other scientists doesn't work—and often backfires. For example, FrameWorks research on translating climate and ocean change science finds that framing messages through the value of "Science Authority"—the idea that change is necessary because scientific research proves the urgency of the problem—did not boost public support for policies needed to address climate change. Other frames around the importance of protecting the future of our society, however, successfully increased public support for these types of policies. Scientists need to understand that, when it comes to informing policy and practice, their audience is *not* other scientists. Who is it, then? It is policymakers, practitioners, service providers, and members of the public—groups that do not have detailed understanding of scientific concepts. Collaborating with those who investigate cultural and social domains can help neuroscientists reimagine their roles as communicators and rethink the ways in which they communicate. Becoming excellent communicators of science to other scientists is, of course, a core focus in most neuroscience training programs. But neuroscientists need to go beyond that. We can and should train scientists to effectively communicate with non-scientists. Fortunately, this is becoming an important area for training expansion (Walsh, 2015). The Alan Alda Center for Communicating Science at Stony Brook University, for example, is advancing this mission. We believe that by having success stories that we can tell about using science to make research-informed policy will not only positively impact society, but also enhance the reputation and value of the scientific endeavor.

The following recommendations (Figure 1) have emerged over nearly two

decades of research into productive ways to communicate the science of early child and brain development for policymakers and the public. These concepts can be applied broadly and can assist scientists in communicating their work and spark a deeper conversation about the role of science in society.

Data and Facts Alone Aren't Effective, but Don't Give Up on Them

We often assume that our audiences think like we do and that what works to convince us as scientists will work in the same way and to the same degree with those outside of our discipline. The fallacy and danger of this assumption is clear: the vast majority of people do not understand brain and early childhood science the way that we do. But changing communications practice is more difficult than it seems. Scientists tend to over rely on data when communicating about the applications and social significance of their work. This approach may convince fellow scientists of the validity of a causal argument or the effectiveness of an intervention, but it won't have the same effect with policymakers and the public. This is not to say that facts don't belong in science communications; they do. We advise scientists to think of their messages as stories. Describing an experiment and providing data can play a role in these stories—they can even be a key plot element—but they are not the story. Facts need to be framed; effective communications use frame elements, such as values, metaphors, and discussions of solutions, to enable our audiences to think about and interpret our data and understand what they mean in the real world. Today's popular post-truth, alternative-fact memes overlook the important role that facts play in communications. They are an essential part of effective explanation—so long as they are well framed.

Frame Science around Values

Values are cultural beliefs and ideals like fairness, justice, and equality of opportunity. Our research shows that framing messages around values helps people understand why a social problem matters. Framing a message around the value of justice (addressing a given social issue is important because it will help ensure that all people are treated fairly) or human potential (taking on a given issue matters because it will ensure that all people can reach their full potential) helps people access and apply science-based explanations of social problems and solutions. In our work on translating the science of early childhood development, we have found that the values of innovation (we can apply our society's ingenuity to come up with better solutions to children's issues) and future prosperity (doing a better job of supporting children is integral to our progress and future success as a society) provide a way for policymakers, business leaders, service providers, and members of the public to engage in science messages and move thinking in positive directions. These values, in other words, help people see why the issue matters. In contrast, using the value of vulnerability (that children deserve more support because they are society's most vulnerable members) fails to move public thinking (as discussed above) and, in some cases, *depresses* support for key policies and programs. Using vulnerability as a value invites people to "other" populations—drawing distinctions between "us" and "them" and making public policies that address social issues seem like more for "them" and less for "us." Using vulnerability as a leading frame also encourages people to employ a fatalistic understanding in which once damage is done, there is little that can be done to meaningfully address it.

Use Metaphors to Explain Scientific Concepts

Research tells us that metaphors have unique power to clarify and explain core scientific concepts. They are highly effective in helping people understand how complex scientific issues work. We have seen this time and time again in our work to develop an evidence-based strategy to communicate the science of early childhood development. Comparing the developing brain to the construction of a house ("brain architecture") helps people understand the powerful influence of early experiences in building a strong neurological foundation and that development happens in a sequential process. Comparing the interactions between a child and his or her caregiver to the back and forth in a game of tennis or volleyball ("serve-and-return") helps people understand how positive interactions with supportive caregivers are major drivers of healthy brain and child development. The metaphor emphasizes the critical importance of social relationships in the process of brain development and makes it easier to discuss the intertwined nature of social, emotional, and cognitive development ("weaving skill ropes"). Using the metaphorical language of toxicity to describe the biological effects of stress on the developing body and brain ("toxic stress") helps people understand how chronic, severe stress undermines healthy development. Metaphors like these bring science out of the lab and into the public discourse. But, as with explanation, not any metaphor will do. Metaphors that work with scientists may not be effective with policymakers or other non-scientists. Metaphors are a key explanatory device, but we must use an empirical process to select the most effective ones. Collaborating with social and cultural scientists is vital.

Know What You Know—and What You Don't Know

It matters more than ever to use neuroscience to improve policy and public understanding of how social issues work and what needs to be done to effectively address them. In our view, scientists need to stay committed to their public roles as explainers. The science of communications can help ensure that neuroscientists are successful in this role and able to effectively drive public discourse and policy in positive directions. When it works, it really works. Our work, and that of our colleagues in early childhood and brain development, is committed to the project of science translation and the power of a two-science approach that draws on both neuroscience and communications science. Neuroscientists will drive public support and political will for investment in science if we demonstrate to the public and to those in decision-making positions the power that scientific research has in solving society's most pressing challenges. Frame On.

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