The success of simple metaphors in communicating brain science

The Alberta Family Wellness Initiative, supported by the Calgary-based Palix Foundation, has succeeded in achieving individual, organisational, and systems level change regarding brain development, epigenetics, mental health, and addiction. The Brain Story, which uses simple metaphors to communicate complex brain science, has proven an effective tool to achieve this change and move towards building more resilient individuals and communities.

Until the 1960s, scientists believed that the brain largely ceased to change once fully developed. We now understand that the brain changes throughout life due to a phenomenon known as neuroplasticity. Many experiences induce neuroplasticity, both positive, such as new learning opportunities, and negative, such as stress. Much of what we now understand about stress is due to the work of American neuroscientist, Bruce McEwen, who was especially interested in the brain's physiological stress system. McEwen was especially interested in the brain's physiological stress system. 1 By activating properly, this system keeps the body in a state of stability, which McEwen called 'allostasis'. However, overactivation of the brain's stress response causes long-term damage, a condition called 'allostatic overload'. Toxic stress inflicts the most damage, especially during childhood and adolescence, which are key windows of neuroplasticity.

Adverse childhood experiences (ACEs) were first investigated in the late 1990s through a collaboration between the Centers for Disease Control and Prevention (CDC) and Kaiser Permanente for their link to adverse health outcomes in later life. 2 ACEs include the following events when they occur prior to 18 years of age: sexual, physical, and emotional abuse, physical or emotional neglect; and growing up in an environment where a parent suffered from mental illness or substance abuse, was absent or incarcerated, or was a perpetrator or victim of domestic violence.

TRANSLATING THE SCIENCE

Broad understanding of the impact of ACEs on lifelong health is essential to improve the outcomes for individuals, families, and communities. In 2006, an interdisciplinary group of scientists from the newly formed Harvard Centre on the Developing Child synthesised a body of scientific evidence on child development to inform science-based policy and practice. Working with the FrameWorks Institute, a non-profit research organisation that makes complex scientific information accessible for broad audiences, they constructed a simple-to-comunicate story about the latest findings on brain development, mental health, and addiction. The development of the story was guided by interviews with people on the street about their understanding of brain development, mental health, and addiction, which revealed deeply entrenched misconceptions. FrameWorks then went back to the scientists and devised a series of simple metaphors that when tested on the public, shifted the public's understanding of these concepts. The Palix Foundation brought FrameWorks to Alberta and found that public beliefs, understandings, and misconceptions about brain development were the same as those held by audiences in the United States, the United Kingdom, and Australia. The story that was created combat the 'swamp' of ideas held by the public about this complex brain science by providing a common language and knowledge base, enabling researchers, policymakers, service providers across sectors, and the public to discuss brain development and its link to mental health and addiction outcomes. In Alberta, this innovation became known as the Brain Story.

THE ALBERTA FAMILY WELLNESS INITIATIVE

The Palix Foundation is a private foundation based in Calgary, AB that works to mobilise the science of child development, mental health, and addiction from the inter-related disciplines of developmental neuroscience, behavioural neuroscience, genetics, and epigenetics. In 2007, the Foundation founded the Alberta Family Wellness Initiative (AFWI) to turn ‘what we know’ about addiction and mental health into ‘what we do’ in practice and service delivery. The neuroscience framework of the AFWI is founded in three principles: (1) the connection between early brain development and lifelong health is essential to improve outcomes for individuals, families, and communities. 2

Understanding the impact of adverse childhood experiences on lifelong health is essential to improve outcomes for individuals, families, and communities.
enforcement, academia, business, and different levels of government. To achieve this integration and shift, the AFWI facilitated a five-year symposium series (Figure 2) in Alberta that exposed an audience of key decision makers to a common language that was grounded in the science of brain development using the simple metaphors of the Brain Story. As a result, the work of the AFWI has helped guide a new approach to policy and practice across sectors (Figure 3). Change begins at the individual level. These individuals then become change agents and initiate change in their organisations. Once a threshold number of organisations change their approach to service delivery, there can be widespread shifts at the systems level.

THE BRAIN STORY METAPHORS

From its inception, the AFWI has championed the Brain Story as a tool for systems level change. The metaphors of the Brain Story are as follows (Figure 4):

- **Brain Architecture:** Brains are not simply born, they are built over time. Just like a house, a brain requires a sturdy foundation to support all future development. This highlights the importance of early childhood and the seriousness of ACEs, which compromise the brain’s foundation.
- **Serve-and-Return:** The most important mechanism of building a sturdy brain foundation is attentive, responsive, serve-and-return interaction between a child and caregiver. Just like in a game of tennis, a child serves by making eye contact, smiling, laughing, or babbling, and the caregiver returns the serve by sharing in the exchange.
- **Air Traffic Control:** Responsive serve-and-return interactions and a sturdy brain foundation support the development of executive function and self-regulation skills. Much like air traffic control at a busy airport, these essential skills help us plan, prioritize, and organise our daily demands to help prevent a mental collision.
- **Reward Dial:** Certain experiences in life, like toxic stress, can undermine brain architecture and contribute to poor mental and physical health outcomes. Shifting the fulcrum can move over time based on life experiences, like toxic stress, can be named and loaded onto the right side of the scale in the form of red boxes. Alternatively, positive supports in the form of safe, stable and supportive relationships and environments can be named and loaded onto the left side of the scale in the form of green boxes. The starting position of the fulcrum can be understood as our original capacity for resilience. However, the position of the fulcrum can move over time based on our skills and abilities, including access to serve-and-return interaction, good air traffic control skills, and a well-functioning reward and motivation system. Shifting the fulcrum to the right provides more leverage to negative experiences.

Resilience is our ability to adapt and remain healthy in the face of adversity. The Resilience Scale serves not only as a metaphor but also as a practical tool to help us assess and monitor resilience and how it may change over time. Adverse life experiences, like toxic stress, can derail the brain’s inherent reward and motivation systems, leading to adverse health outcomes like addiction. These experiences or adversities, and our skills and abilities interact to influence lifelong physical and mental health outcomes.

**Figure 2.** Dr Judy Cameron, Council Member of the National Scientific Council on the Developing Child at Harvard University, Calgary, 2014.

**Figure 3.** The AFWI theory of change highlights the potential horizontal and vertical integration of the Brain Story across all levels of service delivery.

**Figure 4.** The metaphors of the Brain Story.

**Figure 5.** The Resilience Scale metaphor illustrates how positive supports, negative experiences or adversities, and our skills and abilities interact to influence lifelong physical and mental health outcomes.
whereas shifting the fulcrum to the left provides more leverage to positive experiences. These three components of the Resilience Scale (adversities, positive supports, and skills and abilities) interact to determine whether the scale tips towards a positive outcome (e.g., good physical and mental health, healthy relationships, academic or career success) or a negative outcome (e.g., illness, addiction, interpersonal difficulties).

THE BRAIN STORY CERTIFICATION

The primary means through which the AFWI has encouraged uptake of the Brain Story is the Brain Story Certification Course. The 20-hour, self-paced, free online resource features presentations from leading experts in the fields of neuroscience, child development, epigenetics, mental health, and addiction blended with the metaphors of the Brain Story. At the conclusion of 2022, nearly 110,000 people worldwide had enrolled in the Brain Story Certification Course, which is available in both English and French. However, knowing the Brain Story is only the first step. To achieve effective systems change, the knowledge must be applied to achieve action.

In 2020, the AFWI facilitated a community of practice with eight organizations – six in Alberta and two in the UK – working across the fields of early childhood development, human services, health, and mental health and addiction to explore how to apply the Resilience Scale metaphor in practice with the goal of achieving actionable systems-level change. These convenings revealed several applications of the Resilience Scale metaphor as a tool: as a visual tool to talk with clients about building their healthy, responsive relationships to resilience and evaluating their progress; as a framework of organizational theories of change; and as a foundation for developing within- and cross-sector partnerships and client referral pathways. They also found the Resilience Scale metaphor helpful in aligning three key principles previously identified by the Harvard Centre on the Developing Child as necessary in order to shift knowledge to actionable outcomes: reducing the sources of toxic stress that deplete the energy the brain needs for lifelong healthy development; supporting healthy, responsive relationships to build resilience; and strengthening core life skills.

THE AFWI’S IMPACT

In late 2019, the AFWI commissioned an eight-month developmental evaluation which included interviews with 63 key change-agents across various systems, levels, and regions, and a survey of 439 people who participated in the Brain Story Certification Course. One of the most significant findings of the evaluation pointed to the impact of AFWI’s work at the organisational and systems levels. Organisations working across the areas of specific focus to the AFWI – healthcare, children’s services, education, and justice – reported how they had shifted strategic direction to better align with the Brain Story. They allocated funds accordingly, integrated the Story into training programs, began using this shared language within their organisations, and changed hiring practices to ensure staff were best qualified to apply guiding precepts of the Brain Story.

Within Alberta’s Ministry of Children’s Services, the AFWI’s theory of change encouraged significant system-level policy shifts. Change was both top-down by leadership and bottom-up through innovation encouraged by practitioners on the ground. The widespread adoption of common Brain Story concepts and language helped make communication more effective within the ministry and across other critical provincial government ministries. Notably for the Palix Foundation and the AFWI, people across the system reported a fundamental shift in their perceptions – they saw parents and children not as cases but as partners, and viewed them with greater compassion, empathy, and agency. The impact of the Brain Story in Alberta’s Children’s Services was swift and remains ongoing. Shortly after introduction of the Brain Story, policy began to include the language of the Story, making specific reference to the Resilience Scale. This influence then extended to contract allocation among children’s service providers, such as residential care for children. In the summer of 2022, the Government of Alberta, with support from the Government of Canada, committed $3.6 million to support over 3,000 early childhood educators as they become Brain Story Certified and engage in theory-to-practice sessions regarding healthy brain development. 6

The AFWI has seen a number of successes in the health system. Beginning in 2016, the Child and Adolescent Addiction, Mental Health, and Psychiatry Program (CAAMHPP) within Alberta Health Services (AHS) has been collecting ACE data from every client who accesses the program to help inform treatment and prevent the further accumulation of ACEs. This policy shift was instigated following the AFWI’s symposium in 2014 which discussed the importance of ACEs in determining lifespan health outcomes. 7

In the education sector, the AFWI has seen a number of ACEs in children and families by targeting the three components of the Resilience Scale – reducing adversities, increasing positive supports, and developing skills and abilities. Compilation of the Brain Story Certification Course is a preferred qualification for new hires with CAAMHPP. As of February 2023, AHS through Connect Care will begin including ACE data as a part of patient electronic medical records. Including ACEs in electronic medical records will allow both patients and practitioners to better informed about the importance of early life experiences on brain development and their influence on lifelong physical and mental health outcomes. This information will also be essential for health policymakers to better inform the allocation and distribution of resources.

In partnership with the Canadian Centre on Substance Use and Addiction (CCSA), the AFWI led the Brain Builders Lab from 2019–2021. This initiative supported project teams across Canada to embed brain science into their communities. In Alberta, a team within AHS worked to disseminate the Brain Story, highlighting the relationship between ACEs and vulnerability to mental illness and addiction, among their colleagues with an emphasis on service providers in rural areas. The team achieved this goal by hosting a community of practice, motivating their peers to enrol in the Brain Story Certification Course, and creating new Brain Story-based resources that providers could share with families.

IMPLEMENTATION IN THE EDUCATION AND JUSTICE SYSTEM

In the education sector, the Secondary Education around Early Neurodevelopment (SEE) project,
The Brain Story itself remains the most effective tool for mobilising the knowledge of brain development and for driving this change at individual, family, community, and systems levels.

early brain development and how they can interact with young children to help build a sturdy brain foundation. In Alberta, the AFWI is working on developing a Brain Story curriculum to embed into the K-12 curriculum, guided by the success of the SEEN project. The themes of the Brain Story are also present in the justice system. Reforming Family Justice (RFJ) is an initiative that has been ongoing in Alberta since 2013. The goal of RFJ is to move away from an adversarial model of dealing with parental separation and child custody and towards a model that is based in communication, coparenting, and minimising trauma. RFJ emphasises healthy relationships between parents, opportunities to build skills related to dispute resolution within the family unit, reliance on community resources instead of the court system, and education regarding the impact of early life experiences in child development. The ultimate goal of RFJ is to restructure the justice system with a focus on the needs of the child. RFJ is another example of how the Brain Story knowledge created an overall shift in mindset within Alberta.

BEYOND ALBERTA
Knowledgeable, cross-sector partners have been integral in both the foundation and continued success of the AFWI. While the province of Alberta was the primary focus of the AFWI, the translatability of this systems-level approach quickly became apparent as the AFWI began to apply what it learned in the rest of Canada and share insights with aligned international organisations. Most notably in Canada, the province of Prince Edward Island has also made a commitment towards the implementation of Brain Story science across systems. In the UK, the AFWI has partnered with the University of Oxford to deliver the Oxford Brain Story to policymakers, practitioners, and the public at large, which has resulted in a number of research publications and valuable programming. The Oxford Brain Story has been particularly impactful in Blackpool, UK. The Blackpool Better Start initiative reveals how the knowledge of the Brain Story can be successfully applied across sectors to improve outcomes at a community level.

Partnering organisations in Australia are also moving the Brain Story forward across a variety of contexts and systems. Finally, The Harvard Centre on the Developing Child continues to be a valued partner in the work of the AFWI. The translatability of the Brain Story is attributable to a number of key factors including an emphasis on the importance of engagement, having cross-sector partners, and the necessity for a ‘headspace’ entity like the AFWI to provide consistent guidance, resources, and leadership. As a result of this knowledge application, clarity has emerged as to how to measure outcomes and how those outcomes might change over time. Moving forward the AFWI will continue to work with community change agents to disseminate the Brain Story and move towards effective systems change to build more resilient individuals, families, and communities.

The Alberta Family Wellness Initiative (AFWI) facilitates research and shares knowledge about the science of brain development to support positive lifelong health outcomes for everyone. It forms the bridge between the latest scientific knowledge about brain development and tangible change in policy and practice.