

## NeuroView

## Building brain capital

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**Brains are indispensable drivers of human progress. Why not invest more heavily in them? We seek to place Brain Capital at the center of a new narrative to fuel economic and societal recovery and resilience.**

The societal and economic impacts of challenges to optimal brain function are significant (Smith et al., 2021). Disruptions to brain health (i.e., mental and cognitive disorders) cost trillions of dollars and have only been exacerbated by COVID-19 (Smith et al., 2021). Over the past year, our societies have experienced stress and isolation *en masse*. Furthermore, data have shown that a majority of COVID-19 survivors have incurred physiological damage to their nervous systems, the full extent of which has yet to be realized (Fleischer et al., 2021; Smith et al.,

2021). Concurrent to this pandemic, the increasing frequency of climate shocks and their mental health sequelae produced by food insecurity, migration, and war have had disproportionate impact on society as a whole. The mental health consequences of COVID-19 will be the next global pandemic. The unique circumstances created by the COVID-19 pandemic pose serious challenges to mood stability and emotional regulation at all ages. The COVID-19 pandemic will have a lasting impact on our mental health. How the world tackles these challenges

now will determine the well-being of current and future generations and impact the drive to successful recovery and building back societies stronger for the future. Thus, it is no surprise that *The Economist* ranked investment in mental health as an economic “Best Buy” (Economist, 2018).

At the same time, brain skills are becoming increasingly valuable in our modern, innovation- and knowledge-driven economy. Regions with rich educational investment beget more patents; more patents breed technological advancements, which in turn serve as the

foundation for jobs, employment, and a thriving economy. Further, as automation threatens to displace millions of jobs, the workers of the 21<sup>st</sup> century will need to adapt and develop new cognitive skills in order to preserve jobs and income. In the middle of global crises like the COVID-19 pandemic and accelerating climate change, people will also need to rely on proficient brain skills in order to stay emotionally resilient. Together, brain-related economic and societal issues underscore the degree to which we are currently living in a “brain economy.”

Given the critical need to nurture healthier, more resilient, and increasingly flexible brains worldwide, we have introduced the concept of “Brain Capital”—broadly defined as a form of capital which prioritizes brain skills and brain health. We seek to place Brain Capital at the center of a new narrative of progress to ensure economic recovery and resilience now and in the future. Indeed, it is our vision that as leaders measure the health of their nation, they will look not only at conventional measures like gross domestic product (GDP), consumer optimism, and unemployment, but at their Brain Capital—after all, “what gets measured, gets improved.”

Improving brain health is a key building block of Brain Capital. Presently, many mental health conditions that can be prevented are not. Indeed, mental health is currently one of the largest sources of avoidable suffering. For instance, nearly two-thirds of people with a known mental health disorder never seek help from a health professional (Vigo et al., 2019). Data from India and China, which together have one-third of the global population, suggest that more than 80% of those with mental health issues do not seek treatment (Patel et al., 2018). This problem is compounded by a concomitantly high rate of non-response to all available psychiatric and neurological treatments in many individuals. Late-life disorders such as Alzheimer’s disease and Parkinson’s disease are usually attributed to aging and senility—their prevalence will increase with global aging. Furthermore, roughly 90% of employers have noted concomitant declines in employee behavioral health and productivity during the pandemic (Coe et al., 2020). Racial, gender, ethnic, and socioeconomic dis-

parities in brain health have become more evident in the pandemic and require more robust policy solutions. Despite the uniquely deleterious triple impact of biological (e.g., infectious diseases, parasites, and malnutrition), psycho-social (e.g., extreme poverty, socio-economic inequality, conflict, war, displacement, and discrimination), and ecological (e.g., climate-change-related rise in sea levels, cyclones, and bushfires) “toxicity,” brain health has been neglected in the Tropics, an area which will contribute to half of the world population by 2050. This will likely result in significant deficits in Brain Capital hampering the emergence of the economic recovery, taking a further toll on these vulnerable societies. Multifactorial challenges to brain health require innovative frameworks specially designed for vulnerable, diverse, and underserved populations. With this wide foundation of critical problems, there are innumerable interventions that can and should be deployed.

Brain wellness, in turn, allows for optimal brain functioning that is needed to implement economically meaningful brain skills. The combination of the 4th industrial revolution and the post-pandemic context will demand skills essential to adapt to changes. Many of these skills are now essential, while others are gaining ground. Increasing numbers of workers will need to compete in a global market for skills. It will be crucial for them to develop their Brain Capital by training and retraining through their working years in order to compete effectively, necessitating a shift in the way we approach education throughout the lifespan. The jobs of the future, for which we have to prepare today without further delay, will value those skills that make us human, that technology cannot—and hardly ever will—imitate or replace, and that allow us to learn and function in different scenarios. Brain skills include economically indispensable brain-based ensembles of cognition such as resilience, motivation, imagination, exploration, opportunity recognition, goal engagement, innovation, self-control, emotional intelligence, fluid intelligence, curiosity, intellect, creativity, mindfulness, compassion, altruism, systems thinking, metacognition, critical and analytic thinking, communication, cognitive flexibility, memory, and improvisation; all are

part of an individual’s and society’s Brain Capital.

We live in a brain economy that places a premium on creativity and intellectual skills. While some have noted that “data is the new oil,” we believe that Brain Capital is the new oil. As artificial intelligence (AI) systems reach human-level performance in a variety of domains, automation threatens to displace large parts of the workforce. Factory workers, truck drivers, and many white-collar professionals will need to pivot and quickly learn new skills or risk being economic refugees. Considerable progress has already been seen in this area, including a proliferation of “coding bootcamps” to help non-technical workers make the leap into highly technical, difficult-to-automate software engineering roles. Programs like these will be the cornerstones of any transition into a more automated economy, and their foundation is brain health.

As the world slowly recovers from the COVID-19 crisis, we must address, intercept, and prevent related brain issues through a supportive policy environment. New programs require implementation, tracking, and monitoring.

Toward this end, the Organization of Economic Co-operation and Development’s (OECD’s) New Approaches to Economic Challenges Unit (NAEC) has created the Neuroscience-inspired Policy Initiative. This Neuroscience-inspired Policy Initiative seeks to reconceptualize and revitalize the economy and how it works in new ways, laying the groundwork to identify relevant metrics while building a transdisciplinary network of stakeholders. The effort draws on experts from medicine, neuroscience, gender analysis, economic policy, philanthropy, and business. The Initiative will rapidly refine and advance the concept of Brain Capital via a series of research projects, economic modeling, seminars, and clear policy analyses and recommendations. In this context, our Brain Capital Grand Strategy supports the focus of the OECD initiative (Smith et al., 2021). The Grand Strategy has three main components: considering Brain Capital in-all-policies, developing a comprehensive investment plan to support Brain Capital, and generating a Brain Capital Index (Smith et al., 2021).

Brain Capital in-all-policies is conceptually broad with implications and

opportunities ranging from fighting poverty to promoting space flight. In foreign affairs and trade, a “brain health diplomacy” approach has been proposed (Dawson et al., 2020). In the aerospace and aviation sector, long-duration space flights may present a unique opportunity to study and address associated mental health challenges. In women’s issues, major breakthroughs may arise from a specific focus on sex and gender differences in brain function, clinical care pathways, and social determinants. With regard to poverty, the World Bank estimates that, globally, an additional 88–115 million people slipped into extreme poverty last year, and that total is expected to rise to 150 million by 2021 (WorldBank, 2021); eventually, that will likely create major brain health disturbances due to stress, trauma, reductions in educational attainment, and malnutrition. Mental health issues should also be addressed in the context of improving performance within the fields of innovation and entrepreneurship, both of which matter more than ever in today’s innovation-driven, interdependent, competitive, and volatile global economy. Because most new jobs are created by firms less than five years old (Stangler and Litan, 2009), creative and innovative entrepreneurs—with their increasingly recognized brain-behavioral differences—are needed to drive regional and national social and economic growth. Today, more than ever before, our economy is transformed more by unique human brain skills than by raw materials, technology, or knowledge. In many ways, entrepreneurs stand as the critical last firewall against recession and deprivation, serving as economic first responders when catastrophic events produce national and global economic shocks.

Brain Capital provides a transdisciplinary framework for organizing and accelerating existing constructive projects, both public and private. Moreover, the Brain Capital Investment Plan proposes to leverage diverse sources of capital (e.g., venture capital, private equity, government grants, philanthropy, healthy brain bonds, megafunds, and Environmental-Social-Governmental [ESG] Ex-

change Traded Funds) to achieve its aims (Smith et al., 2021).

The private sector actively understands the need to invest in brain health, thus fundamentally recognizing the value of Brain Capital. One indicator is venture capital investments in mental health technologies, which neared US \$1 billion in 2020 (Shah and Berry, 2020). Many mental health startups have reached “unicorn” status. For example, Lyra Health, a technology-enabled workplace mental health provider, reached a valuation of US \$2.25 billion and has visibly increased workplace mental health support. The Davos Alzheimer’s Collaborative initiated a first-of-its-kind global public-private collaborative linking discovery research, clinical trials, and health system readiness across high-, middle-, and low-resource countries to tackle Alzheimer’s disease in a new way. The Healthy Brains Global Initiative is pioneering health brain bonds to raise USD \$10 billion for brain health research.

In the public sphere, international organizations including the United Nations (UN) have noted the critical importance of protecting mental health and wellbeing during the COVID-19 pandemic. The UN launched a series of high-profile programs such as World Mental Health Month, the UN System Workplace Mental Health and Wellbeing Strategy, and the Shadow Pandemic Campaign. In April 2020, more than 1,000 mental health experts and advocates from more than 40 countries signed an open letter calling on global leaders to integrate mental health into their COVID-19 recovery plans. This initiative is critical, given that a full third of countries allocate less than 1% of their total health budgets to mental health. Estimates suggest that if spending on mental health increased to recommended levels, there would be at least 60 million fewer cases of anxiety, depression, and epilepsy between now and 2030. Put another way, over the next 10 years, we could globally gain 25 million healthy life years and avoid 200,000 deaths.

The brain economy is here to stay, and clear thinking is required to resolve the existential challenges we face. Therefore,

Brain Capital should be at the heart of a systemic recovery, enabling a long-term, global, and whole-systems approach to boosting economic and societal resilience.

#### DECLARATION OF INTERESTS

H.E. reports fees from PRODEO, LLC. W.H. reports income from the OECD. No other authors declare competing interests.

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