

## ANNALS OF THE NEW YORK ACADEMY OF SCIENCES

Issue: *Advances in Meditation Research: Neuroscience and Clinical Applications***Foreword to *Advances in Meditation Research: Neuroscience and Clinical Applications***

It is my great privilege to introduce this volume of *Annals of the New York Academy of Sciences* and highlight the unique scientific dialogue borne of the remarkably successful conference series “Advances in Meditation Research” (AMR). For these accomplishments I must first thank the speakers for their dedication and work; my co-organizers, Rael Cahn and David Vago, for endless hours of preparation; filmmakers Susan Finley and Bruce Bailey; Vassia Alaykova for her inspired design; and the conference participants for their contributions, persistence, and positive feedback that has prompted early planning for the next AMR conference in 2015. The simple goal of this meeting was to create meaningful clinical and educational applications for meditation practices by scientific inquiry and technological invention. I will briefly discuss the essence of these meaningful applications in the context of specific studies that are leading translational meditation research.

Meditation research has emerged strongly from the neurosciences (biological, neural, and cognitive platforms), and the science of gerontology (science of aging) has been rejuvenated by genetics. Fittingly, the AMR conference presented the latest advances in neuroscience, aging, and their clinical applications, and the first organizing principle was the inclusion of a range of meditative practices in the investigational framework. This stance stems from the recognition that there is a meditation for everyone, at every stage of the process of self-knowledge. Furthermore, it makes sense that hypotheses for meditation research be guided by canonical texts or teaching lineages that have preserved the techniques in geographical and cultural isolation over several centuries. Invariably, these schools teach that there is a progression in the practice that is accompanied by defined mental and physiological states, and as seen here, recent research studies show very distinct neural correlates and functionality in focused attention versus nurturing compassion or self-transcending, as described by Fred Travis and Zoran Josipovic.

We also find that these schools practice harmonizing self-techniques: physical and mental, visualization and sound/breath, active and passive, devotion, and deep regulation of body functions. Although study of individual components may have theoretical value, greater integration should be considered for the study of meaningful clinical applications. In turn, evidence-based science can be used to overcome social differences. Accelerated cultural exchange between the East and West in recent years has embedded contemplative practices in the daily lives of many Americans who have become acquainted with very different systems of medicine. Overly medicated, and raised in a highly competitive and overly stimulated environment, many Americans have come to embrace a true sense of responsibility and agency to listen, learn, and cultivate simpler and grateful ways of living. This is, after all, what meditation teaches. Several lines of research are pointing to the fact that there is an uncanny health side effect to the practice of single-pointed focus, self-regulation, and the nurturing of others as self (compassion, love), which are central to meditation. On the one hand, single-pointed focus, counter to the multitasking malaise of our society, pulls the reins of the mind away from external dependence, thereby decreasing background noise, mental chatter, and capitalized resources. This is important because the brain can optimally handle a limited number of events

at a given time, normally choosing by order or intensity of experience and not by order of benefit or importance.

Besides the great utility of the focused attention technique to enhance learning and cognitive training, as evidenced by the work of Judson Brewer and others, there is perhaps greater benefit from the fact that it allows human beings to fine-tune emotions by temporarily disconnecting areas of the brain involved in executive decision making from areas of the brain that process emotional intensity and memory. At a higher technical level, meditation has the potential for transforming maladaptive mental habits and biases and developing internal conflict-resolution skills. As described by David Vago in his paper, the combination of focused attention and detachment, or noting and labeling, may reduce bias in early stages of perceptual processing that result in more efficient allocation of attentional resources, and a more accurate worldview and reflection of reality, with direct and indirect effects on well-being and personal fulfillment. This might be the first fire the meditator walks through, and the first skill learned—how to disconnect from negative cues that disable executive functions and attention. Another has to do with reconnecting with positive affect and opening the heart (recognizing others as self or connected in essence). Brain-imaging studies show heightened connectivity between prefrontal areas and emotional processing areas in meditators of the compassion style, compared to meditators of open monitoring or focused attention. Joe Loizzo presents an authoritative perspective on the impact of these findings on future research directions.

Joshua Grant, an expert in the neuroscience of pain, explains that meditative analgesia, a capacity learned by meditators to not feel pain, is not associated with focused attention but rather with the open-monitoring (noting and labeling) process in meditation. New studies are suggesting that cultivating compassion and loving-kindness to self and others may confer great resilience to feeling pain, possibly by the release of natural opioids. According to Willoughby Britton, meditation has been mischaracterized as a relaxation technique that is intended to decrease all forms of arousal and promote sleep. Her research has shown that after an initial effort, meditation elicits sustained wakefulness and lower sleep propensity, suggestive of greater processing efficiency or neuroendocrine plasticity. Excellent reviews by Eileen Luders from the University of California, Los Angeles, and Tim Gard and colleagues from Massachusetts General Hospital describe how minimally invasive brain imaging, electroencephalographic technologies, and genetics have revealed causal relationships between stress “wear and tear,” cognitive decline, brain degeneration, and aging. They have pioneered the notion that meditation counters these effects and may even have preventive, preserving, or enhancing effects. Importantly, Yi-Yuan Tang and Andrew Newberg show that short-term interventions are clinically relevant in the pediatric and elder populations. However, dose–response or threshold effects of meditation, and the teacher–student relationship, are still completely open to scientific scrutiny.

I will close this foreword noting that the grant and funding mechanisms for studying the health benefits of contemplative practices are still scarce or limited in scope, undoubtedly in part due to the expectation that it is challenging to generate quality data from such studies. The AMR conference has proven that this is an outdated misconception and that the new generation of meditation researchers is trained as meditators, bringing interdisciplinary skills, methodological knowledge, and the latest technologies to the table.

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