

Interdisciplinary Science and Yoga: The Challenges Ahead

Scientists have an obligation to tackle societal challenges.^[1] Hence, scientific research needs active engagement of multiple disciplines so that logical solutions can be gained. In 2015, nature discussed the importance of interdisciplinary research.^[2] Why? While engaging the global warming issue for instance, scientists have realized that climatologists armed with atmospheric data alone cannot solve the intriguing climate riddle. In fact, data on environmental history, human nature, ecology, development, philosophy, and societal thoughtfulness are equally important to comprehend the challenges posed by changing climate. Then only, workable solutions can be put in place to defend society before it is too late.

Likewise, health is fundamental for human survival. Hence, topics ranging from yoga practice to choice of food consumption are equally important subject matters for interdisciplinary research to safeguard humanity. As a matter of fact, yoga has become popular due to its capacity to transform human health both physically and mentally. Although yoga was initially treated as a mystical practice buttressed by Hindu philosophical footing, it gained global popularity during the 1980s as an excellent scheme of exercise. The yoga concept has eight components that include ethics, self-discipline, physical posture, breath control, sensory transcendence, mental focus, meditation, and the final state of ecstasy.^[3] However, people are more attracted toward the easier fragment of exercise and that's why yoga has mushroomed as an economic enterprise endorsing wellness worldwide. The annual turnover in the USA alone has increased from USD 6.9 billion in 2012 to USD 9.9 billion in 2015; it is projected to reach up to USD 11.5 billion by 2020.^[4]

Where does science stand in the saga involving yoga? The answer may depend on whom the question is directed. Some scientists may outrightly deny any connection to science since yoga deals with Hindu spiritual practice by means of deep thinking. Thus, it may go beyond systematic scrutiny of structure and behavior of the physical world tested through logical experiments. Whether yoga is categorized as a body–mind technique or a topic of philosophy, it must go through series of logical scrutiny till rational conclusions are derived on its precise scientific validity endorsing human health. Any subject that goes through rational inquiry largely depends on fundamental research. However, yoga lacks resilient fundamental research, which is a stumbling block for scientific precision. In order for yoga to attain wider acceptability, fundamental research is central. As yoga deals with complex facets on the functional aspects of body and mind, disciplines such as biology, physiology, neurology, genetics, and psychology are inevitably allied. Thus, interdisciplinary science has a

strategic role to play in reshaping fundamental research on yoga.

Even if we consider yoga as an applied field of research, the quality of papers originating from India has not reached the top world journals. A quick search of the word “yoga” in Web of Science (WoS) from 1955 to 2018 yielded only 3805 papers. The maximum number of papers (47.4%) originated from USA with India's contribution being only 12.5% regardless of yoga being originated there millennia ago. Other countries such as Australia, the UK, Canada, and Germany have contributed each over 5% (<http://apps.webofknowledge.com/WOS>). The year of publication shows that yoga has gained scientific attention since 2009. Hence, yoga has definite potential to evolve scientifically if high-quality research can meet the global gold standard.

When I searched the phrase “yoga” in Google Scholar, it resulted with 618,000 hits. It is obvious that large number of yoga papers from India end up in substandard predacious journals due to weaker sensitivity among scientists to uphold higher scientific quality. To make matters worse, a review article titled “Are Indian yoga trials more likely to be positive than those from other countries?” published in *Contemporary Clinical Trials* has declared that the experiments done in India are 25 times more likely to get positive conclusions than other countries.^[5] The review warns the scientific community at large not to trust data on the helpfulness of yoga sprouting from India.

Hence the question is, do researchers start with preconceived ideas and present their data to support their prejudiced views? I wonder though how many yoga experimental trial protocols and datasets are available on open source for public scrutiny across India, which has become a norm for good-quality research practice. Besides, yoga papers portray trials lasting for few days to few weeks to declaring outrightly that yoga helps.^[6,7] If scientists cannot sustain perfection supported by logical long-term data enhanced by randomized controlled trials with significant sample size, what's the point to show-off yoga's usefulness to the scientific community? It's therefore time for Indian scientists to positively introspect the concrete comments expressed by the review paper to set new directions to enhance ethics, integrity, and perfection in science.^[5]

The Government of India plans to open yoga departments in all central universities. Besides, the construction for a new inter-university center for yogic sciences has already started at Bangalore (www.deccanherald.com/state/centre-yogic-sciences). While engaging yoga in the academia, the government cannot afford to lose its vision to uphold high-quality research output integrating ethical

eminence. The fastest way forward is to enforce a policy instructing all yoga scholars to publish only in journals listed by WoS since it has a long list of 12,226 journals with impact factor (IF). Among them, 104 journals are published from India, and the list starts with *Energy for Sustainable Development* (highest IF 2.658) and ends with *Indian Journal of Horticulture* (lowest IF 0.096). If all researchers focus to publish papers in reputed local journals, they will not only enhance the quality of research but also increase the IF of journals.

In 2016, an editorial appeared in *Nature* stated on the importance of recruiting social scientists to address societal confronts of sustainability and health issues.^[8] Yoga has been intimately linked to human health since millions believe in its amazing benefits. However, critiques argue that diverse yoga brands such as Anusara, Ashtanga, Bikram, Hatha, Hot, Isha, Iyengar, Kundalini, Laughing, Vinyasa, Restorative, and so on add to more confusion with dissimilar experimental testing conditions.^[9] Even though setting a scientific quality benchmark for comparing different styles of yoga is a challenging task, an earnest effort is desperately needed. It is crucial to compare the effects of different yoga types in order to standardize methodological protocols. Then only, it will be easier for scientists to authenticate and replicate appropriate yoga-related scientific experiments with minimal bias.

Review articles have repeatedly painted the enduring inadequacies of yoga research, and the thorniest concerns widely range from lack of randomized control trials to subjective self-selection of samples and from weak sample size to insufficient control and comparison groups.^[9,10] Therefore, yoga needs to undergo thorough scientific facelift, and then only ambiguities engulfing the idiosyncratic nature of the yoga catchphrase can be logically tested through interdisciplinary science to establish validity, credibility, and excellence at last.

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