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Developing a Small Theory of Treatment of Yoga

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Abstract

With a recent trend to medicalize yoga, it is important to ensure that its application for health is evidence based and that efficacy or effectiveness of yoga is evaluated rigorously. The method of 'theory based evaluation' regarding health interventions has been in vogue since the 1970s. Although there is now substantial research to understand the mechanism of action of yoga that may point to a theory and sometimes even serve in its stead, it is not the same thing as a theory (of yoga). Currently there is no cogent theory of yoga, primarily because there is a missing link in the causal pathway that connects practice of yoga to its ultimate health effects and benefits. Along the lines of the 1993 groundbreaking work of Mark Lipsey, who suggested developing small theories of treatment for evaluation research, this article offers a hypothesis to elucidate the missing link for the development of a small theory of treatment of yoga and examines the implications of the absence of such a theory as well as the advantages such a theory offers.

Yoga has been researched for almost a century now. Yoga's mechanism of action has also been extensively investigated and many different explanatory models are being offered. The models can explain one or more facets of yoga but do not offer a cohesive unified theory in a parsimonious way. Despite all efforts in research, it is still not exactly known how yoga works. There appears to be a missing link. This gap is subtly undermining the utility of yoga by precipitating problems at many levels. This article offers a hypothesis that might explain how yoga might work at its core. In doing so it draws from the ancient Sanskrit scriptures as well as from the modern research on the mechanism of action of yoga. It is proposed that 'frequency of thoughts' is the ultimate channeling variable through which yoga brings about its effect and the beneficial effects of yoga might be in inverse relationship with the frequency of thoughts. It is further hypothesized that a reduction in the frequency of thoughts changes the "initial conditions" in the networks of thought systems and subsequently cascades into the beneficial effects seen in the secondary systems of the body like humoral, metabolic or endocrine. Supportive evidence for the hypothesis is also discussed. Finally a note is added about the implications for various stakeholders and concluded that if the hypothesis is correct, it can facilitate a revision in the way yoga is understood, practiced, and evaluated.

Introduction

Yoga is presently considered as a complementary and alternative medicine modality [1]. However, there is an emerging trend to medicalize it and use it as a part of integrative medicine [2,3]. This in turn is leading to recognition of yoga as a therapy rather than a mere spiritual or health promotional activity [4]. Naturally, discussions regarding licensure, regulation, and third party payment for its services have ensued [5]. The decisions regarding the best policies and practices related to these issues, which must be driven by evidence, require the support of a solid foundation of evaluation research. Yoga has been researched for almost a century now and a huge body of literature is available that has examined and elucidated its various facets from different perspectives [6]. As a part of that process, yoga's mechanism of action has also been extensively investigated and many different explanatory models are being offered [7]. However despite all efforts in research, it is still not exactly known how yoga works [8]. There appears to be a missing link at the very core. This gap is subtly undermining the utility of yoga by precipitating problems at many levels related to its practical implementation. Knowledge about yoga's mechanism of action has been uncovered primarily by empirical research, which in turn has been usually guided by theory, albeit sometimes the theory is tacit. This also implies that mechanism of action is not the same thing as theory.

The former are models that can explain one or more facets of yoga but do not offer a cohesive unified explanation of its entirety in a parsimonious way. An absence of a good guiding theory makes the discovery of causal pathways a process of trial and error and renders the designs of empirical research too broad and vague for causal inference and generalization [9]. At least that appears to be the case when it comes to yoga. This is not to say that extant literature is devoid of a theoretical backdrop or is ignorant about a potential candidate for the missing link. Rather on the contrary there are abundant clues in ancient scriptures on yoga that provide a robust philosophical framework for building a theory of yoga [10]. On the other hand, many scholars who

examined the mechanism of action of yoga [7,11-13] have come very close to articulating the missing causal pathway. However, neither ancient literature nor modern scholarship has explicitly identified the foundational premise, leaving scope for general misinterpretation. In a recently published paper on yoga, the author commented that there is currently no cogent theory of yoga [14]. Similarly, Sedlmeier et al. in their 2012 meta-analysis and then again in their 2014 commentary has suggested that a full-fledged theory of meditation [yoga] does not exist [15,16]. Both comments are made in reference to the above context.

Therefore a caveat is in order at this point. The primary aim of this article is to connect the dots in a more efficient way after taking cues from ancient scriptures and modern research on the mechanism of action of yoga. It makes no claim to a novel thesis, but seeks to add perspective with the potential to help resolve many practical challenges in handling issues related to yoga. The following short commentary discusses the research regarding the mechanism of action of yoga, points out the missing link, lists the effects of the gap, delineates the two approaches to bridge the gap, and finally offers a hypothesis that might explain how yoga might work at its core. A note is added to outline implications for the stakeholders if the hypothesis proves to be correct.

Current Research in Mechanism of Action of Yoga

Kuntsevich et al. [8] propose humoral, nervous, cell trafficking and bio electromagnetic as four transduction pathways by which yoga modulates its effects and they offer three hypotheses to explain how it might work. One of these hypotheses suggests that yoga quenches abnormal noise in cellular and molecular signaling networks [8]. Uebelacker et al. explain the action of yoga on the basis of biological, psychological and behavioral mechanisms. They suggest that one of the mechanisms by which yoga works is to reduce rumination [11]. Brownstone uses neurodevelopment treatment theories and sensory integration theories to explain mechanism of action of postures. These are peripheral mechanisms of action of yoga and only explain in part how postures bring about their effects [17]. Kinser et al. expound neurobiological mechanisms of yoga. Their model elaborates on various neurobiological substrates or circuits in order to explain how yoga works [12]. Similarly, Streeter et al. base their theory on neurophysiology and suggest that yoga reduces allostatic load in the stress response system [18].

Qu et al. focus on gene expression to explain long-term action of yoga[19]. Gard et al. develop a composite top-down and bottom-up theoretical model of yoga using cognitive neurosciences and psychological theory. Their schema attempts to reconcile both peripheral and central mechanisms by which yoga brings about its effect [7]. Riley and Park identify biological & psychological theories to explain the action of yoga [20]. Singh offers psycho neuro endocrine immunological basis for yoga action [21]. Tang uses neurobiological mechanism to explain yoga [22]. McCall in her review identifies mechanism of action of yoga based on its effects on endocrine, nervous, cardiovascular, metabolic, immune, and cognitive systems of body [23]. Recently Shetkar et al. [24] developed a systems biological theory of yoga, which postulates that yoga brings about optimal regulation by restoring criticality within the physiological systems [24]. Scholars like Srinivasan, Nagendra, and Bhavnani have tried to integrate ancient Indian "panchakosha" in saṃkhya philosophy with modern human biology of autonomic nervous system regulation to offer a theory of yoga. Their work is an approach to reconcile eastern and western philosophies as applied to analyzing mind-body interactions [25].

The Missing Link

Kuntsevich et al. say in their introduction, "However, we also recognize that such examples are simply demonstrations of end effects, but do not really reach to the core of ''what yogic practices do'' in the process of improving systemic regulation or ''restoring balance'' to the system" [8]. These words succinctly summarize the predicament of research regarding the understanding of the essence of working of yoga. Put in a different way, the hypotheses or theories discussed in the previous section do not explain how activities of yoga such as postures, breathing or meditation announce themselves to body systems, nor how they actually operate. The current models seem logically sound in explaining how yoga brings about its effects at the secondary or tertiary levels only after an assumption is made that somehow via a hitherto unknown pathway the various cognitive systems, autonomic nervous system, endocrine, metabolic, immune, and cardiovascular systems in the body are triggered by yoga. How these systems are triggered is not clearly delineated or understood, although many of the above propositions provide hints to a possible pathway [7,12]. It appears that there is a missing link in the schema (Figure 1).

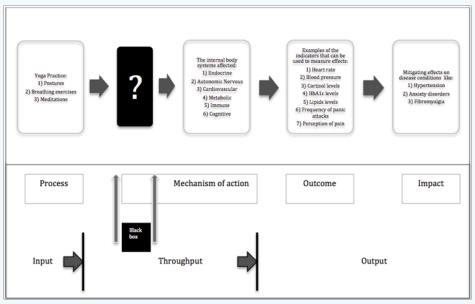

Figure 1: A schematic model to elucidate the spectrum of yoga practice and its effects.

Effect of the Gap on the Perception and Practice of Yoga

The lack of insight regarding this missing link in the mechanism of action of yoga has several ramifications including:

a. It does not allow the assertion that yoga is unique. Fraser Watts in his paper stipulates that while yoga has

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many benefits, it is not unique and that techniques like progressive relaxation or transcendental meditation deliver similar results [26].

b. As a corollary of the first, it deprives researchers of a potential key to throughput variable(s) that can allow yoga effects to be isolated from those of the confounders. It is known that the biggest challenge in proving yoga's efficacy is the presence of confounders like good health [27], education and income [28], non-specific factors in treatment like expectancy or teacher personality [29], or environmental factors like room temperature or humidity.

c. Ambiguity regarding the core mediating mechanism does not support appropriate definition of yoga. It cannot be said whether postures, breathing exercises, and meditations form a single unified yoga practice or if these are three independent, different but similar modalities which have become bundled up due to an historical accident.

d. It does not allow the ability to draw any inference regarding the relative efficacy of the three major components of yoga without relying on component analysis (a technique different from a similarly named tool in statistics called principal component analysis) [30].

e. The unresolved issue creates an opportunity to characterize yoga as a mysterious, occult, semi-religious esoteric practice.

f. The phenomenon of having a black box in the explanatory schema of the mechanism of action of yoga can make some stakeholders suspicious of the efficacy of yoga.

It is therefore important to identify the missing link.

Two approaches to bridge the gap

There are two ways in which this missing link can be uncovered:

a. Use an empirical approach.

b. Develop a theory.

Although the former way is more reliable and scientifically robust, it requires tremendous resources in terms of funding, time, and insight for designing innovative research experiments to detect it. In current times, research funding is dwindling [31]. Secondly, research trials consume a lot of time and require replication before meaningful inferences can be drawn from them. Finally, due to a catch-22 type of relationship between empirical research and theory, empirical research depends on an implied theory of some sort for its design. In absence of such insight it becomes a process of trial and error.

On the other hand, a faster, cheaper, and relatively easy way is to develop a theory of yoga and then quickly test it. If the results prove the theory wrong, one can abandon the theory and try another one that can be developed based on the lessons learned from the previous experience. Of course, this approach relies on, among other things, a good intuition. Even then, it often proves to be a more pragmatic approach.

Idea of theory as a method or a tool is not new. Conceived in the early 1970s and reaching its full fervor by 1993, Theory Based Evaluation (TBE) has been firmly established in health behavior interventions evaluation research [9,32]. Additionally, in a 1993 paper, Sechrest and Figueredo said: "Under many circumstances, strong theory can compensate for relatively weak method" [33]. Due to the fact that yoga is a holistic way of life, the research method for yoga is always going to be weak. Along this line, a recent article on meditation research indicated that [yoga] research might be better served when it is driven by theory [34].

Mark Lipsey, in a seminal paper in 1993 suggested that small theories of treatment (or therapies or interventions) can unlock the famous Ashby's black box to explain the underlying causality in a fairly reasonable way while at the same time offering tangible practical cues to understanding the nature of control and experimental populations or input and outcome variables that enable evaluators to assess efficacy [9]. A hypothesis pointing towards the missing link will be proposed below along the above line of thinking.

Hypothesis in Lieu of a Small Theory of Treatment of Yoga

It is interesting to note that the earliest discourse on yoga in the ancient Sanskrit scriptures began as theories and these references provide clues to the missing link. References to yoga are scattered among the following: Kaṭhaka Upaniṣad (6: 10,11); Svetasvatar Upaniṣad (2: 8,11,12,13); Maitrayaṇiya Upaniṣad (6: 18-21); Muṇḍaka Upaniṣad (3:2: 6); Taittiriya Upaniṣad (2: 4) and the entire Patanjali Yoga Sūtras [10,35,36]. Apart from elaborate discussions about death and immortality there are discussions about the origin of the notion "I" as a coevolving function of "passage of time". For example presence of multitude of "I" within a person is discussed in Kaṭhaka Upaniṣad (2: 6; 3: 1); Svetasvatar Upaniṣad (1: 9; 4: 6,7); Maitrayaṇiya Upaniṣad (3: 1,2,3; 6: 1,36); and Muṇḍaka Upaniṣads (3: 1,2) while the illusory nature of "I" is discussed in Kaṭhaka Upaniṣad (4: 11) and Svetasvatar Upaniṣad (1: 10). Timelessness or stoppage of time is discussed in Svetasvatar Upaniṣad (4: 4); Maitrayaṇiya Upaniṣad (6: 14, 15); and Patanjali Yoga Sūtras (1: 26; 3: 13; 4: 20,25). Most importantly, stillness or cessation of thoughts is referred in Kaṭhaka Upaniṣad (4: 13; 6: 10); Maitrayaṇiya Upaniṣad (4:6: 1; 6: 30, 34:1, 3, 8, 11); and Patanjali Yoga Sūtras (1: 12, 18, 43, 44, 47, 51; 4: 22).

The allusion to stillness and cessation of thoughts and stoppage of time are crucial in understanding the mechanism of action of yoga. One can easily see a logical continuum between stillness and cessation of thoughts leading to a perception

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of timelessness (stoppage of time), leading to dissolution of "I" (a shadow of the passage of time), leading to a perception of immortality and providing health benefits as a byproduct. It appears that the sages who contemplated on yoga were focused on the perception of immortality and not on the actual immortality of the body which is clearly stated in Kaṭhaka Upaniṣad 2: 18.

If total stillness or cessation of thoughts is seen as the ultimate goal, stage, or accomplishment of yoga, then one can imagine some type of quantitative relationship between thoughts and their effects on the body (mind-body continuum), beginning with plenty of thoughts causing a lot of ripple effects, ending in nonexistence of thoughts causing minimal effects. It may not be clear whether that relationship is linear or non-linear. However, one can speculate, envisioning a simple linear model wherein the beneficial effects of yoga might be in inverse relationship with the frequency of thoughts.

If this premise is accepted then 'frequency of thoughts' can be deemed as the ultimate channeling variable through which yoga brings about its effect. Yoga is shown to act through peripheral as well as central mechanisms [7]. This central mechanism should prove to be the dominant mechanism of action of yoga. In that perspective, the effects of postures and breathing exercises, though they might also mediate through peripheral mechanisms as described by Brownstone (sensory integration) and Streeter et al. (modulation of Vagus nerve afferent signaling) respectively, should emanate primarily through reduction in thought frequency (mainly reducing negative distractive thoughts) through enhanced focus and attention associated with those two activities [17,18]. It is also proposed here that the role focus and attention play in the effect of yoga should be of a competitive antagonism type. Many pharmaceutical drugs work on this principle. In this mechanism, the drug molecule prevents the undesirable biological molecule in the body from getting attached to the concerned receptor, thereby causing a desirable effect. Something equivalent might be happening in case of yoga. It has been noted by scholars that yoga brings calmness by suppressing rumination and reduction in distracting thoughts (Figure 2).

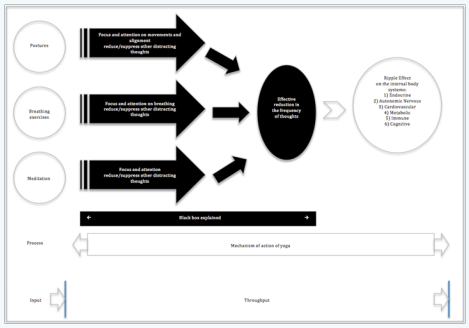

Figure 2: The missing link in the mechanism of action of yoga.

Thought process in the human brain is extremely complicated and complex and best described by systems theories entailing feedback and feed-forward loops. Scholars like Gard et al. and Kisner et al. have elaborated on the mechanics of the complex functional networks in different parts of brain [7,12]. Succinctly, it can be hypothesized that reduction in the frequency of thoughts changes the "initial conditions" in the networks of thought systems and subsequently cascades into the beneficial effects seen in the secondary systems of the body like humoral, metabolic or endocrine [37]. Reduction in frequency of thoughts can also cause long-term beneficial effects but that discussion is beyond the scope of this article.

There is evidence in existing literature that suggests that the proposed hypothesis might be true. For example, a large (n=178) Randomized Control Trial (RCT) of yoga intervention for anxiety and depression found: "…that 'thought reduction' or 'mental silence' may have specific effects relevant to work stress…". The study emphasized that the "mental silence" or "reduction of thought activity" oriented approach had a better comparative efficacy over the other relaxation or meditation techniques [13]. Another prior study corroborated with the findings of these authors [38]. A paper studying Hatha yoga for depression also noted the significance of mental silencing as a mechanism [11]. Kuntsevich et al. have proposed that one of three ways in which yoga acts is by "quenching noise" in cellular and molecular signaling networks arising from environmental or internal stresses [8]. Gard et al. mention that meditation has the ability to bring about active inhibition of specific brain regions [7]. Other preliminary research efforts suggest a connection between postures and mental activities [39]. In the discussion, Manocha et al. say: "The fundamental change in emphasis…to the experience of 'suspension of thought activity'…raises an important question about whether or not this shift in conceptualization has practical and clinical significance" [13].

There is not much research about operational metrics that can measure the frequency of thoughts accurately. Anecdotally, in 2005, a National Science Foundation funded study at Keck School of Medicine at University of Southern California found that the average thought frequency was 60,000 to 70,000 thoughts per day [40]. However, the results were never published in a peer-reviewed journal and hence no data are available about the methodology that the scientists used. Manocha et al. used diary cards [13]. Davidson and Kaszniak and Thomas and Cohen have commented on the use of experience sampling [41,42]. It is also possible to infer the frequency of thoughts based on MRI, only if one is fully aware of the dangers and shortcomings of reverse inference [43].

As stated earlier, the hypothesis above is a candidate for the missing link. There could be another equally plausible or better explanation. Further research is needed to test the proposition.

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Some implications for stakeholders

A. Practitioners of yoga

Practitioners might put emphasis on focus and attention leading to diminishment in the quantity of distracting thoughts (mostly negative) - irrespective of which component (postures, breathing exercises or meditation) is practiced.

B. Educators-teachers

Instructors might find it beneficial to incorporate more elements of focus in their teaching. For example, while teaching postures, they might prefer teaching them in slow mindful high-attention motion, or freeze their students in a posture for a while. Additionally, they might want to increase the proportion of meditation component in their module.

C. Referring prescribers

Referring providers should advice their patients to seek out those programs emphasizing mental components.

D. Payers

Payers might want to ensure that the programs have an emphasis on mental focus components. Payers will also be able to discern between yoga and similar modalities like progressive relaxation.

E. Researchers

a. In surveys or questionnaire related to yoga, meditation (and breathing) would not be taken out of yoga as a separate variable.

b. In any evaluation design, there would be at least some outcome variable that can quantify frequency of thoughts such as diary cards, thought sampling or more sophisticated instruments like fMRI if they can discern thought frequencies.

Conclusion

It has been clearly established that yoga has great potential in various aspects of health [44,45]. However, even today, the field of yoga, in both its practice and research, appears to be in some disarray. Reasons for this predicament include a lack of clear understanding as to how yoga works and what yoga components are more effective. If the hypothesis turns out to be correct, it will facilitate a revision in the way yoga is understood, practiced, and evaluated. A tested small theory of treatment of yoga as proposed can help tremendously to reduce waste and redundancies in practice and research of yoga and therefore in turn help its utilization for health.

Authors' Contributions

This is a single author paper & author made the entire contribution.

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References

1. Bethesda (2016) Yoga as a Complementary Health Approach. National Institutes of Health. National Center for Complementary and Integrative Health (NCCIH).
2. McCall T (2007) Yoga as medicine: The yogic prescription for health and healing. Bantam Books.
3. Kepner J (2003) Alternative Billing Codes and Yoga: Practical Issues and Strategic Considerations for Determining" What is Yoga Therapy?" and" Who is a Yoga Therapist?". International Journal of Yoga Therapy 13(1): 93-99.
4. Fischer-White T, Taylor AG (2016) Credentialing and Policy Update for Yoga Teachers and Yoga Therapists: Implications for Yoga Research and Yoga Therapy Research. J Yoga Phys Ther 6: 2.
5. Elgelid S (2001) Insurance Reimbursement: What it Might Mean for the Profession of Yoga Therapy. International Journal of Yoga Therapy 11(1): 99-102.
6. Khalsa SB (2004) Yoga as a therapeutic intervention: a bibliometric analysis of published research studies. Indian J Physiol Pharmacol 48(3): 269-285.
7. Gard T, Noggle JJ, Park CL, Vago DR, Wilson A (2014) Potential self-regulatory mechanisms of yoga for psychological health. Frontiers in human neuroscience 8: 770.
8. Kuntsevich V, Bushell WC, Theise ND (2010) Mechanisms of yogic practices in health, aging, and disease. Mount Sinai Journal of Medicine 77(5): 559-569.
9. Lipsey MW (1993) Theory as method: Small theories of treatments. New directions for program evaluation 1993(57): 5-38.
10. Bryant EF (2009) The yoga sutras of Patanjali: A new edition, translation, and commentary. (1st ed.)North Point Press, USA.
11. Uebelacker LA, Epstein-Lubow G, Gaudiano BA, Tremont G, Battle CL, et al. (2010) Hatha yoga for depression: critical review of the evidence for efficacy, plausible mechanisms of action, and directions for future research. Journal of Psychiatric Practice 16(1): 22-33.
12. Kinser PA, Goehler L, Taylor AG (2012) How might yoga help depression? A neurobiological perspective. Explore (NY) 8(2): 118-126.
13. Manocha R, Black D, Sarris J, Stough C (2011) A randomized, controlled trial of meditation for work stress, anxiety and depressed mood in full-time workers. Evidence-Based Complementary and Alternative Medicine 2011: 8.
14. Patwardhan AR (2016) Yoga Research and Public Health Is Research Aligned With The Stakeholders' Needs?. Journal of Primary Care & Community Health 2150131916664682.
15. Sedlmeier P, Eberth J, Schwarz M, Zimmermann D, Haarig F, et al. (2012) The psychological effects of meditation: A meta-analysis. Psychological bulletin 138(6): 1139-1171.

16. Sedlmeier P, Eberth J, Schwarz M (2014) Meta-Analyses and Other Methodological Issues in Meditation Research: Reply to Orme-Johnson and Dillbeck (2014). Psychological bulletin 140(2): 617-622.

17. Brownstone A (2001) Therapeutic mechanisms of yoga âsana. International Journal of Yoga Therapy 11(1): 11-14.

18. Streeter CC, Gerbarg PL, Saper RB, Ciraulo DA, Brown RP (2012) Effects of yoga on the autonomic nervous system, gamma-aminobutyric-acid, and allostasis in epilepsy, depression, and post-traumatic stress disorder. Medical hypotheses 78(5): 571-579.

19. Qu S, Olafsrud SM, Meza-Zepeda LA, Saatcioglu F (2013) Rapid gene expression changes in peripheral blood lymphocytes upon practice of a comprehensive yoga program. PloS one 8(4): e61910.

20. Riley KE, Park CL (2015) How does yoga reduce stress? A systematic review of mechanisms of change and guide to future inquiry. Health psychology review 9(3): 379-396.

21. Singh VP, Khandelwal B, Sherpa NT (2015) Psycho-neuro-endocrine-immune mechanisms of action of yoga in type II diabetes. Ancient science of life 35(1): 12-17.

22. Tang YY, Hölzel BK, Posner MI (2015) The neuroscience of mindfulness meditation. Nature Reviews Neuroscience 16: 213-225.

23. McCall MC (2013) How might yoga work? An overview of potential underlying mechanisms. Journal of Yoga & Physical Therapy 3: 130.

24. Shetkar RM, Hankey A, Nagendra HR (2016) Reason For Health Benefits Of Deep Meditation: Self Organized Criticality Restores Regulation To Optimal. European Journal of Pharmaceutical and Medical Research 3(5): 435-441.

25. Srinivasan TM (2012) Models and mechanisms in yoga research. International journal of yoga 5(2): 83-84.

26. Watts F (2000) Psychological research questions about yoga. Mental Health, Religion & Culture 3(1): 71-83.

27. Shrank WH, Patrick AR, Brookhart MA (2011) Healthy user and related biases in observational studies of preventive interventions: a primer for physicians. Journal of general internal medicine 26(5): 546-550.

28. Birdee GS, Legedza AT, Saper RB, Bertisch SM, Eisenberg DM, et al. (2008) Characteristics of yoga users: results of a national survey. J Gen Int Med 23(10): 1653-1658.

29. Greco CM, Glick RM, Morone NE, Schneider MJ (2013) Addressing the "it is just placebo" pitfall in CAM: methodology of a project to develop patient-reported measures of nonspecific factors in healing. Evid Based Complement Altern Med 2013: 9

30. Harrigan JM (1981) A component analysis of yoga: the effects of diaphragmatic breathing and stretching postures on anxiety, personality and somatic/behavioral complaints. Diss Abstr Int 42(4A): 1489.

31. Fischer-White TG, Taylor AG (2013) Yoga: perspectives on emerging research and scholarship. J Yoga Phys Ther 3: e113.

32. Weiss CH (1972) Evaluation Research: Methods for assessing program effectiveness. (1st ed.) Prentice Hall, USA.

33. Sechrest L, Figueredo AJ (1993) Program evaluation. Annual review of psychology 44: 645-674.

34. Orme-Johnson DW, Dillbeck MC (2014) Methodological concerns for meta-analyses of meditation: Comment on Sedlmeier et al.(2012). Psychological bulletin 140(2): 610-616.

35. Hume RE (1921) The Thirteen Principal Upanishads: Translated From The Sanskrit with an Outline of the Philosophy of the Upanishads and an Annotated Bibliography. (1st ed.) Oxford University Press, USA.

36. Olivelle P (1996) Upaniṣads. Annotated text and translation. (1st ed.) Oxford University Press, USA.

37. Hillis WD (1988) Intelligence as an emergent behavior; or, the songs of eden. Daedalus.

38. Aftanas L, Golosheykin S (2005) Impact of regular meditation practice on EEG activity at rest and during evoked negative emotions. International Journal of Neuroscience 115(6): 893-909.

39. Michalak J, Troje N, Heidenreich T (2011) The effects of mindfulness-based cognitive therapy on depressive gait patterns. Journal of Cognitive and Behavioral Psychotherapies 11(1): 13-27.

40. Loni. Loni Laboratory of Neuro Imaging. Los Angeles CA. Keck School of Medicine at University of Southern California. Education: Brain Trivia.

41. Davidson RJ, Kaszniak AW (2015) Conceptual and methodological issues in research on mindfulness and meditation. American Psychologist 70(7): 581-592.

42. Thomas JW, Cohen M (2014) A methodological review of meditation research. Frontiers in psychiatry 5: 74.

43. Poldrack RA (2011) Inferring mental states from neuro imaging data: from reverse inference to large-scale decoding. Neuron 72(5): 692-697.

44. Pascoe MC, Bauer IE (2015) A systematic review of randomised control trials on the effects of yoga on stress measures and mood. Journal of psychiatric research 68: 270-282.

45. Youkhana S, Dean CM, Wolff M, Sherrington C, Tiedemann A (2015) Yoga-based exercise improves balance and mobility in people aged 60 and over: a systematic review and meta-analysis. Age Ageing 45(1): 21-29.