Letter to Editor　　　　　　　　　　　　　　　　　　　　　　　　**Open Access**

Evidence for Tai Chi as a Therapeutic Mind-Body Intervention for Sleep: A Commentary on Raman et al. Review and Meta-Analysis

Baland Jalal[*]

Center for Brain & Cognition, University of California at San Diego, USA

*Corresponding author: Baland Jalal, Center for Brain and Cognition, Mandler Hall, UC San Diego, 9500 Gilman Drive, La Jolla, CA, USA, Tel: 92093-0109; E-mail: bjalal@ucsd.edu

Letter to the Editor

In the article, "Tai Chi Improves Sleep Quality in Healthy Adults and Patients with ChronicConditions: A Systematic Review and Meta-analysis" [1], the authors pursue the commendable task of addressing sleep outcomes with Tai Chi. To date many studies have reported the overall physiological and psychological benefits of Tai Chi across all age groups, and for healthy individuals as well as patients with health conditions including coronary artery bypass surgery, heart failure, hypertension, acute myocardial infarction, arthritis, Parkinson's and multiple sclerosis. Similarly, there are data to suggest that Tai Chi promotes health in older research participants, and is a safe therapeutic intervention for this population [1,2].

However, in spite of the seemingly multifaceted health benefits of Tai Chi, it has been correctly argued [2] that many of the studies examining Tai Chi's impact on health lack meticulous scientific methods and rely too much on subjective self-report measures, instead of objective and behavioral outcome measures of health benefits.

The fact that the research literature on Tai Chi vis-à-vis psychological and physiological health is limited in scope and scientific rigor is evident in the aforementioned systematic review article and meta-analysis, exploring the quantitative evidence for Tai Chi practice on sleep quality. For example, 4 out of the 9 randomized clinical trials (RCTs) selected for analysis by Raman and colleagues were graded as having "poor quality" and did not report on blinding for outcome assessors.

Moreover, out of the articles deemed eligible for inclusion, only one study provided objective behavioral outcome data for sleep [i.e., measure of Electrocardiogram derived estimation of cardiopulmonary coupling]. While this may seem trivial, it is well known that there is often incongruence between self-perception and objective measures of sleep (e.g. polysomnography) [3], which are why such data is critical.

In addition, the fact that 4 out of the 9 RCTs selected for analysis included more than 80% women, emphasizes the limited nature of the data available on the topic. Furthermore, there is research to suggest that in addition to normal age related changes in sleep, subjective insomnia is often mediated by physical ailments and disorders associated with old age [4]. In the article under discussion, the age range of the mean ages of the 9 RCTs ranged from 50-77 years, with an overall mean of 63.6 years, which is quite high; likewise, 5 out of the 9 RCTs were composed of elderly individuals with physical disorders (including fibromyalgia, cerebrovascular disorder, and heart failure).

Another major limitation of the literature on Tai Chi and sleep is the variability and poor control conditions used in RCTs. In the 9 RCTs, the placebo conditions ranged from health education to low impact exercise; only two of the trials included stretches, while none included deep breathing. Whilst it remains unknown what exact psychological mechanisms Tai Chi promotes, it is quite possibly related to psychological flexibility and cognitive control (e.g., strengthening of attentional networks as in mindfulness), and physiological flexibility promoted via stretching and deep breathing (comparable to yoga, applied muscle relaxation, and stretching in some mindfulness-based cognitive behavioral treatments [MB-CBT]). The authors Raman et al. notes that Tai Chi may be therapeutic for sleep insofar as it promotes the mind-body connection, possibly by restoring the balance between sympathetic and parasympathetic activity (i.e., stimulating the latter). This may certainly be the case. However, given the nature of the placebo conditions included in these studies, it is, arguably, difficult to reach such a conclusion. That is, at best the data suggest that Tai Chi may be more likely to promote healthy sleep, compared to receiving health education, doing daily stretches, or doing low impact exercise. Ideally control interventions, would include physical exercise-comparable to Tai Chi in stimulating physiological arousal-deep breathing and stretching.

Finally, the authors note that one of the limitations of their review is that it considered only studies published in English, and propose that studies conducted in other languages should be considered for future review and meta-analysis. We concur, particularly regarding Chinese studies, as the Chinese quite possibly may have the largest volume of such research data to date. However, as noted by Wang and colleagues [2], all the studies published in Mainland China, Hong Kong, and Taiwan report positive results between Tai Chi and health, which may be due to both lack of scientific rigor, and publication bias. Thus such studies should be interpreted cautiously.

Future research on Tai Chi's impact on sleep should include more scientifically rigorous RCTs, with more suitable control interventions. Moreover, it would be interesting to compare Tai Chi with traditional CBT and the more recent MB-CBT. That is, in what way is Tai Chi distinctive from CBT, or other "mind-body" therapies in promoting sleep? What are the exact psychological and biological mechanisms of benefit? A more ambitious endeavor would be to map out a cognitive model of Tai Chi and sleep, outlaying the various components of cognition involved and their respective interaction; e.g., similar to our own "Nodal Network Model (NNM) of Affect"-a MB-CBT model for trauma related disorders [5].

In final, in spite of the scattered and limited literature on Tai Chi and sleep, Raman et al. manage to provide a succinct overview of the research on the topic, for which they should be lauded. Their article offers a concise summary and syntheses of the data to date, which allows future researchers to detect gaps and limitations in the literature, design more scientifically rigorous studies, and explore new and interesting ideas related to Tai Chi and sleep.

Acknowledgements

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