

Meta-Analysis of the Beneficial Effects of Mindfulness-Based Interventions (MBIs) on Immunity and Common Autoimmune Disorders

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Abstract

Stress has been shown to disrupt healthy immune function, influencing or triggering the development of specific autoimmune disorders, such as rheumatoid arthritis and systemic lupus erythematosus. The utilization of mindfulness-based interventions has been associated with a reduction in specific immune markers. This meta-analysis reports on the beneficial effects of these mindfulness-based inventions on the immune response to stress and makes a case for further research on such.

Keywords: Autoimmune disorders; Immunity; Meditation; Prayer; Qigong; Yoga

Abbreviations

CRP: C-Reactive Protein; IL-6: Interleukin 6; MBI: Mindfulness-Based Intervention; MDD: Major Depressive Disorder; NK: Natural Killer; SLE: Systemic Lupus Erythematosus; TNF- α : Tumor Necrosis Factor-Alpha

Introduction

According to a National Health Interview Survey, about one out of five Americans have sought or utilized some form of mindfulness-based intervention (MBI) during one year [1]. Prayer, meditation, yoga, Qigong, and Tai Chi are some of the most utilized MBIs. Research on their therapeutic safety and efficacy is becoming a prominent topic in research—investigating specific MBIs' influence on immunological processes [2].

There is a need, along with interest, to understand the immune effects that MBI has to offer. As is known, human immune activity is affected by stress, trauma, and other physiological disturbances. According to Keng, *et al.* (2011), stressors are known to disrupt protein function, alter cytokine production, impair innate immunity, interfere with the hypothalamic-pituitary-adrenal (HPA) axis, and cause other aberrant immune activities [3].

Research has demonstrated the immunological burden of stress and what can be expected in those afflicted by chronic stress. However, research has been unable to predict precisely which part (and to what extent) of the immune system MBIs can affect beneficially [3].

When examining immune activity in response to MBI, epigenetic biomarkers are progressively becoming incorporated in chronic condition-assessments, looking for DNA methylation changes. Iliopoulos, *et al.* (2009) reported that various individuals with poor physical

health demonstrated significant levels of inflammation and unique patterns of DNA methylation [4]. Tracking changes in epigenetic markers in immunity may provide insight into the mechanism of action of MBIs on immunity during stress. In particular, as noted by Stefani, *et al.* (2013), genes that code for inflammatory proteins and cytokines may be helpful to measure since several chronic conditions from major depressive disorder (MDD) to systemic lupus erythematosus (SLE) have shown to have inflammatory and epigenetic adjustments [5].

Discussion

Beneficial effects of yoga, Qigong, and Tai Chi on immunity (immunological markers)

When carefully examined, as done by Harkess, *et al.* (2016), there seems to be no statistically significant difference in epigenetic changes in CRP, IL-6, and TNF- α in response to brief yoga intervention. Nonetheless, additional investigation is needed to confirm the validity of these results, or if longer yoga sessions are required to show epigenetic changes [6]. According to Morgan, *et al.* (2014), nine studies that assessed the impact of MBIs on CRP in patients with chronic conditions, such as heart failure, type 2 diabetes, and major depression disorder (MDD). In a meta-analysis by Morgan, *et al.* (2014), nine suitable quality trials were included in their results; meditation (n = 3), Tai Chi (n = 3), Qigong (n = 1), and yoga (n = 2), which rose to 710 participants in total [1].

Hulett and Armet (2016) showed that yoga, Qigong, or Tai Chi, in twenty-three randomized control trials (RCT) and non-RCT, demonstrated statistical significance when compared to controls. Score reports taken throughout the therapies showed improved quality of life, enhanced mobility, and increased energy when compared to controls [7]. In terms of immunological significance, yoga, Qigong, and Tai Chi corresponded to decreased levels of cortisol ($P < 0.05$), over weeks to months when compared to controls. However, a weaker positive relationship (not statistically-significant) demonstrated corresponded to decreased C-reactive protein (CRP) and cytokine activity in those who practiced yoga, Qigong, or Tai Chi [7].

Beneficial effects of meditation on immunity (immunological markers)

Meditative therapies typically focus on easing stress and advancing states of relaxation. Data from anecdotal, retrospective, and some prospective studies have shown immune changes among specific individuals with mental illness. Data regarding meditation have shown reduced inflammatory markers and increased antiviral response in adults with psychological stress [8].

Relaxation and visualization therapy (RVT) has shown promise. RVT helps facilitate mental “unwinding” by focusing on cognitive imagery to picture desired outcomes or goals [9]. Self-transcendence is a form of meditation that assists an individual in abating the sense of time and place to focus on a broader, universal view [10].

Meditation has shown to decrease serum CRP. However, meditation has failed to demonstrate influence on direct cell-mediated immunity regarding IL-6, IL-8, and TNF- α [1]. When eleven meditation studies were combined and analyzed, the results showed no difference in IL-6 levels when compared to control ($P = 0.08$) in 6 – 16-weeks treatment [1]. Nonetheless, inflammatory markers and genes are upregulated during stressful times [6]. Thus, it may prove helpful to look for protein-markers or epigenetic changes, such as DNA methylation; TNF, IL-6, IL-8, CRP, TNF- α , and cortisol may also prove helpful.

Beneficial effect of prayer on immunity (immunological markers)

There is a dearth of scientific research that explains in detail the influence that prayer, religion, or spirituality may have on immune function [11]. However, what is known is doing MBI (meditation, yoga, Qigong, or Tai Chi), 1–3 times per week for 1–2 hours can reduce CRP levels. Jahnke, *et al.* (2010) found that, when CRP was measured in subjects utilizing meditation, yoga, Tai Chi, or Qigong for 7–16 weeks, modest statistically-significant improvements ($P = 0.04$) on CRP levels occurred, compared with control [12]. Thus, it may prove helpful to investigate prayer’s effect on immune markers, determining if it shows similar or different results to what occurs with meditation, yoga, Qigong, or Tai Chi.

An inflammatory response can be activated under stress, with the release of inflammatory cytokines, IL-6, TNF, acute-phase proteins, and CRP. In some reports, prayer has shown a positive influence in limiting or reducing inflammatory markers; however, the findings are inconsistent, and heterogeneity exists commonly [13].

Studies have confirmed that breast cancer cells proliferate during stress. Also, in stress, immune function—specifically, natural killer (NK) cell activity and T cell response—is diminished, resulting in uncontrolled malignant growth [14]. Some prayer “techniques” or religious practices are used by approximately twenty percent of people diagnosed with breast cancer. Thus, there is a need to integrate studies that focus on blood chemistry (measuring CRP, IL-6, IL-8, TNF-a, and cortisol levels) [1]. Further research regarding prayer and immune activity during stress may help define any beneficial mechanistic effects of spirituality and or MBI, in general, on the immune response.

Conclusion

Stressors (and stress) are known to disrupt protein function, alter cytokine production, impair innate immunity, interfere with the HPA axis, and cause other aberrant immune activities. Stress can compromise healthy immunity and promote specific autoimmune disorders, such as rheumatoid arthritis and systemic lupus erythematosus. Prayer, meditation, yoga, Qigong, and Tai Chi are some of the most utilized MBIs that have shown therapeutic safety and efficacy in “de-stressing” or “unwinding” while in some cases limiting or diminishing immune response biomarkers, such as CRP, IL-6, IL-8, TNF-a, and cortisol. However, research has been unable to predict precisely which part (and to what extent) of the immune system MBIs can affect beneficially. Undertaking further research regarding the effect of mindfulness-based interventions on immune activity during stress is evidenced and seems justified.

Conflict of Interest Statement

The authors declare that this paper was written in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

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