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Stress moderation impacting lupus with exercise: Effects of daily moderate exercise and stress modification on autoimmune-mediated inflammation in mice and humans with lupus

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Despite numerous studies indicating the positive effects of exercise and psychological stress reduction in autoimmune disease, these therapeutic modalities are currently under emphasized. To immunologically characterize disease pathology, the NZM2410 mouse model of lupus nephritis was either exercised daily at moderate intensity or exposed to psychosocial stress induction. Histopathological analysis demonstrated that stressors exacerbated and exercise significantly reduced lupus nephritis disease pathology, as measured by blood urea nitrogen levels, renal IgG and complement component 3 complex deposition, and pathological grading of H&E-stained kidney sections. Furthermore, stress induced levels of IL-6, TNF-α, and IL-1β, while exercise suppressed IL-6, TNF-α, IL-10, and CXCL1. To translate these results, a pilot cohort of active systemic lupus erythematosus (SLE) patients was enrolled into a daily Tai Chi program, which emphasized moderate exercise and meditative breathing. Questionnaires confirmed a significant reduction in perceived social stress and an increase in combined metabolic equivalent of task (MET) and overall physical activity. Furthermore, fitness activity tracker data showed a significant increase in steps, distance, and activity calories with no changes in body mass index or vigorous activity levels. Interestingly, this correlated with an increased time in bed each night on average for each SLE patient. Analysis of pro-inflammatory serum cytokine expression revealed suppression in the relative fold change of IL-6, IL-8, TNF-α, and IFN-ɣ with Tai Chi. Collectively, our data suggests that moderate exercise and stress management can have potent immuno-regulatory effects on the chronic, systemic inflammation associated with SLE and establish Tai Chi as a viable adjunct therapeutic intervention.

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