



Yoga and Immune Function

Yoga Alliance Webinar May 21, 2020

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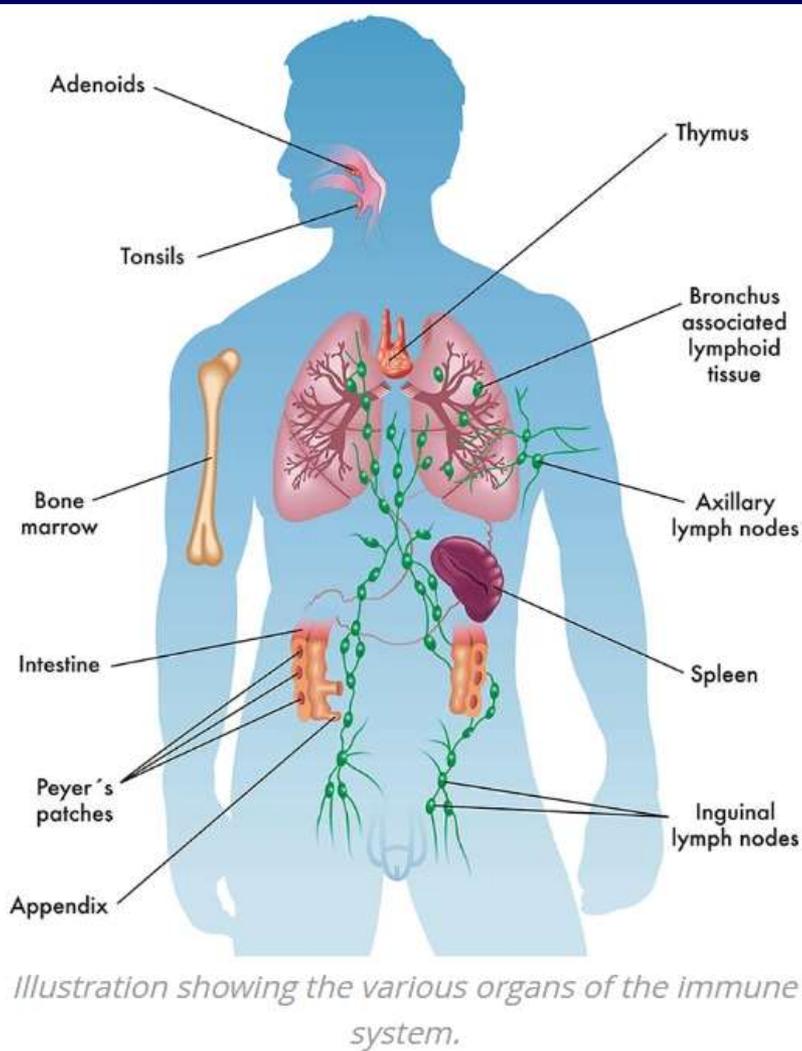
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Immune System



Cells

- Lymphocytes
 - T-cells, B-cells, NK cells
- Phagocytes
 - Neutrophils, Monocytes, Macrophages, Mast Cells

Molecules

- Immunoglobulins
- Cytokines

<https://www.healthdirect.gov.au/immune-system>

Psychoneuroimmunology and Stress

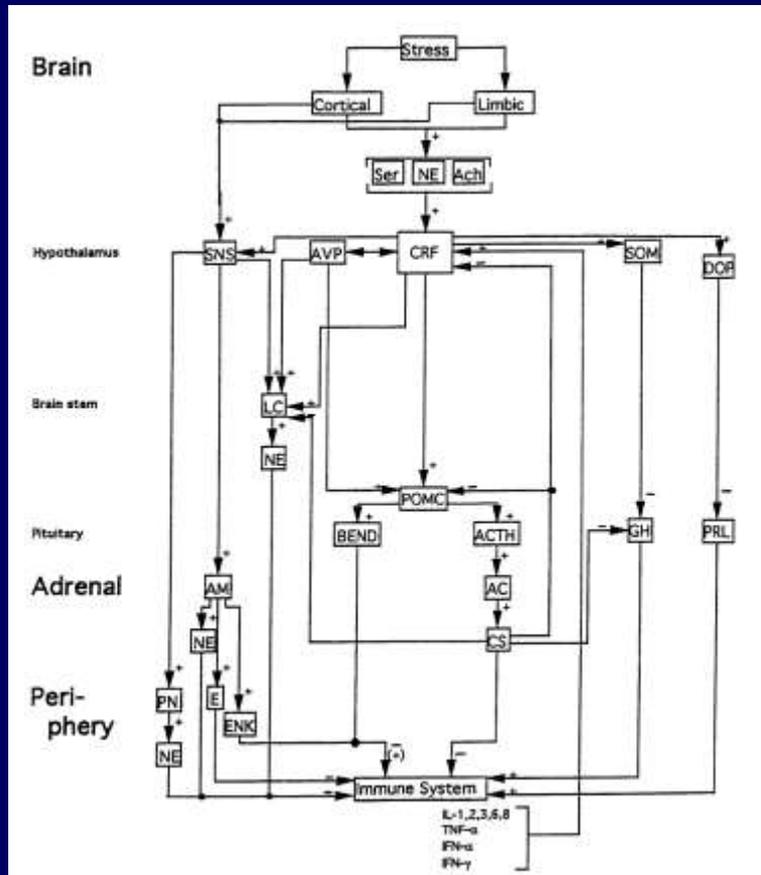


TABLE 1. Some neurotransmitters, neuropeptides, neurohormones, or neuroendocrine effector molecules which both are affected by stress and can modulate immune system function^a

Molecule
Neurotransmitters
Norepinephrine
5-Hydroxytryptamine (serotonin)
Acetylcholine
Opiates
Dopamine
Neuropeptides
Arginine vasopressin
Substance P
Vasoactive intestinal polypeptide
Cholecystokinin
Oxytocin
Melatonin
Neurohormones
CRF
Corticotropin
Corticosteroid
Growth hormone
Prolactin
Somatostatin
Neuroendocrine effector molecules
Epinephrine
Sex steroids
Thyroxine
Tri-iodothyronine

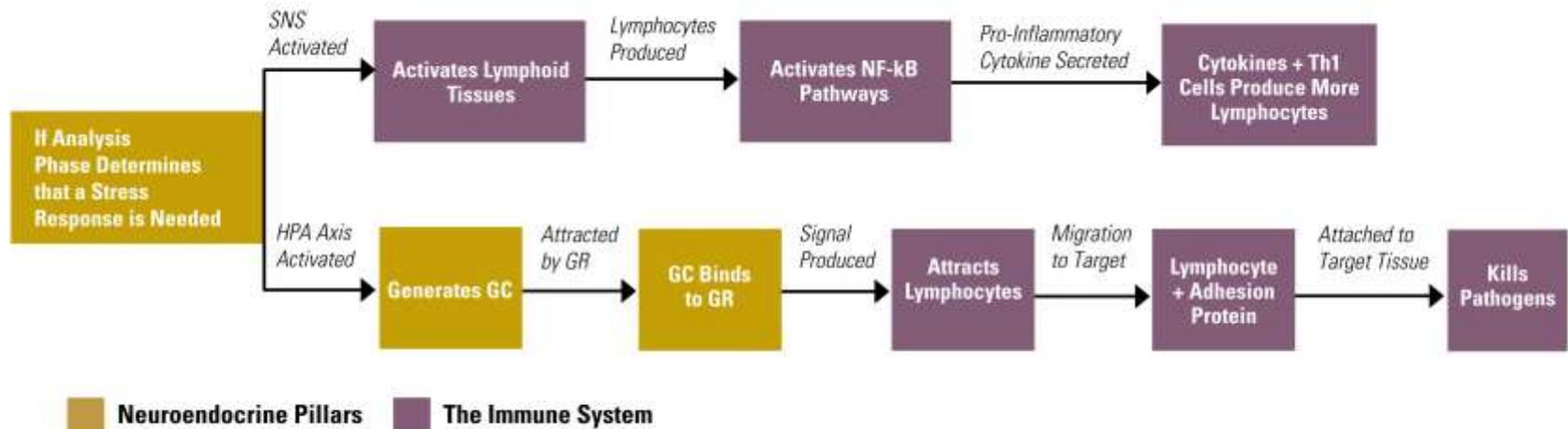
^a These categories are not mutually exclusive. For example, the neuropeptides oxytocin and arginine vasopressin are also considered to be neurohormones.

From: *Central nervous system-immune system interactions: psychoneuroendocrinology of stress and its immune consequences*, Black PH, *Antimicrobial agents and chemotherapy*. 38:1-6, 1994.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC284388/pdf/aac00367-0007.pdf>

Psychoneuroimmunology and Stress

Figure 4. Immune Response to Stress

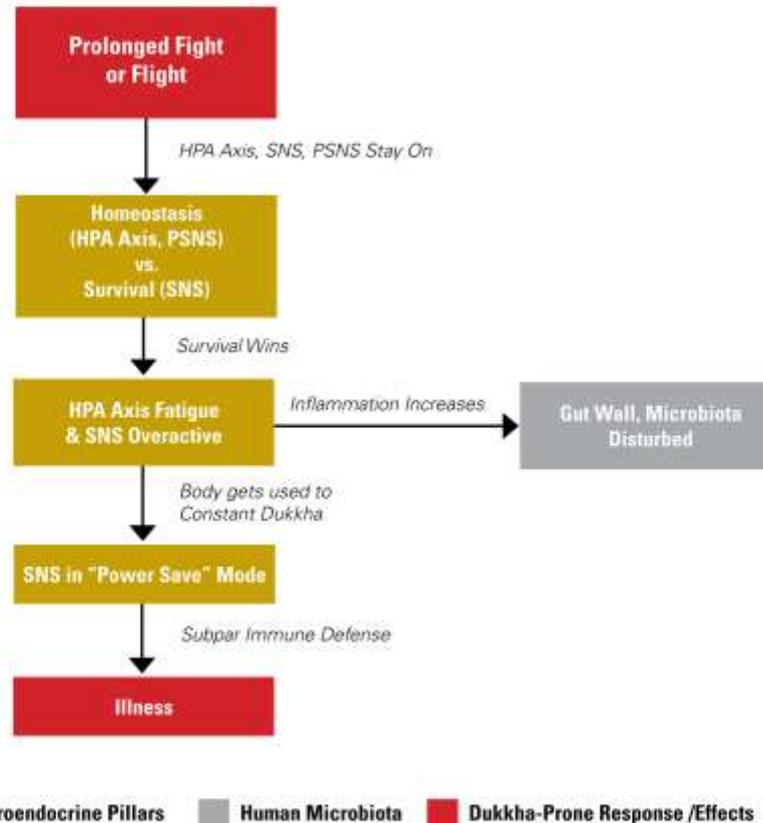


Abbreviations: SNS, sympathetic nervous system; NF-κB, nuclear factor kappa-light-chain-enhancer of activated B cells; Th1, T-helper1; HPA, hypothalamic-pituitary-adrenal; GR, glucocorticoid receptors; GC, glucocorticoid.

From: *The Effects of Stress and Meditation on the Immune System, Human Microbiota, and Epigenetics*, Househam AM, Peterson CT, Mills PJ, Chopra D, *Advances in Mind Body Medicine*, 31:10-25, 2017.

Psychoneuroimmunology and Stress

Figure 10. Stress Can Become Chronic



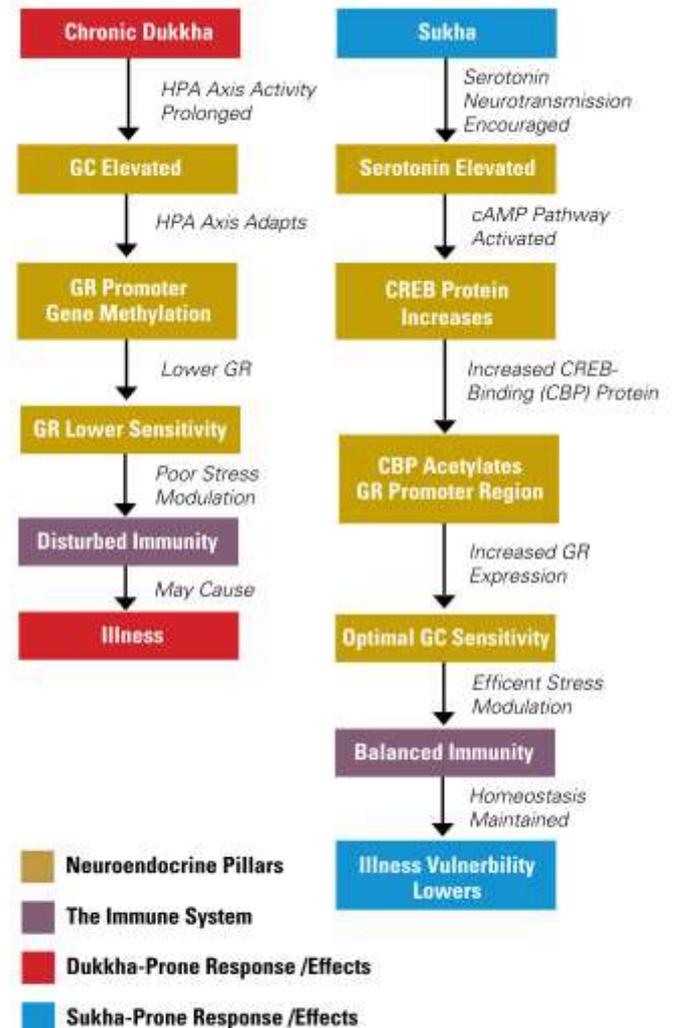
Abbreviations: HPA, hypothalamic-pituitary-adrenal; SNS, sympathetic nervous system; PSNS, parasympathetic nervous system.

From: *The Effects of Stress and Meditation on the Immune System, Human Microbiota, and Epigenetics*, Househam AM, Peterson CT, Mills PJ, Chopra D, *Advances in Mind Body Medicine*, 31:10-25, 2017.

Psycho- neuroimmunology and Stress

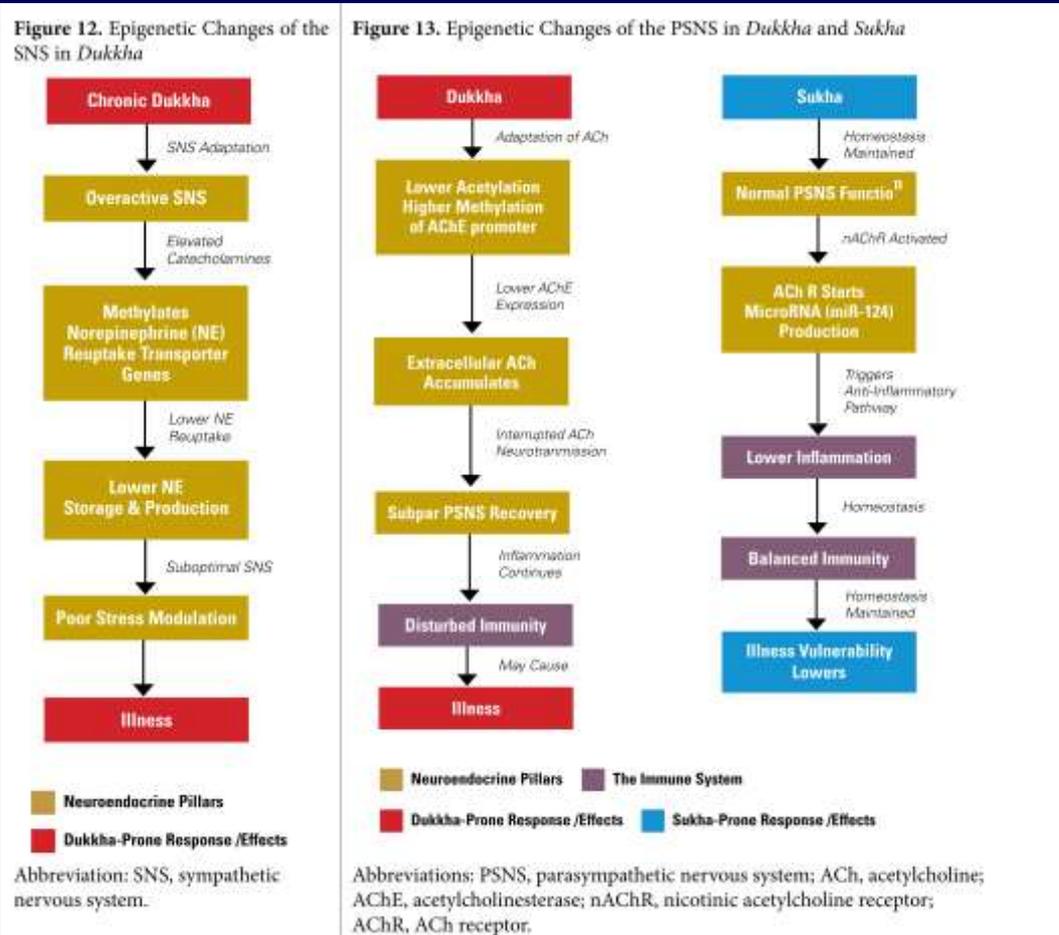
From: *The Effects of Stress and Meditation on the Immune System, Human Microbiota, and Epigenetics*, Househam AM, Peterson CT, Mills PJ, Chopra D, *Advances in Mind Body Medicine*, 31:10-25, 2017.

Figure 11. Epigenetic Changes of HPA Axis in *Dukkha* & *Sukha*



Abbreviations: HPA, hypothalamic-pituitary-adrenal; GC, glucocorticoid; GR, glucocorticoid receptors; CREB, cyclic adenosine monophosphate (cAMP) response element-binding protein; CBP, CREB-binding protein.

Psychoneuroimmunology and Stress



From: *The Effects of Stress and Meditation on the Immune System, Human Microbiota, and Epigenetics*, Househam AM, Peterson CT, Mills PJ, Chopra D, *Advances in Mind Body Medicine*, 31:10-25, 2017.

Psychoneuro-immunology and Stress

From: *Psychoneuroimmunology-developments in stress research*, Straub RH, Cutolo M, *Wiener Medizinische Wochenschrift*, 168:76-84, 2018.

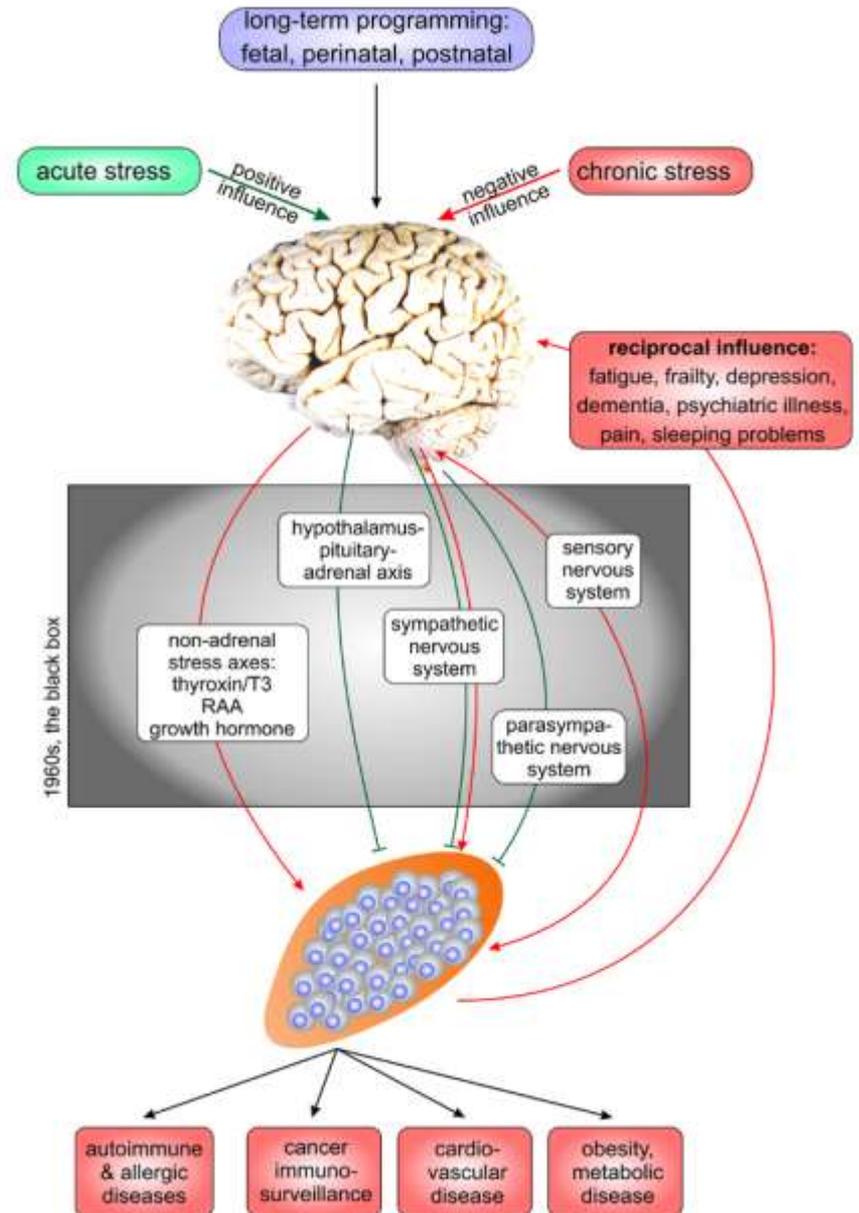
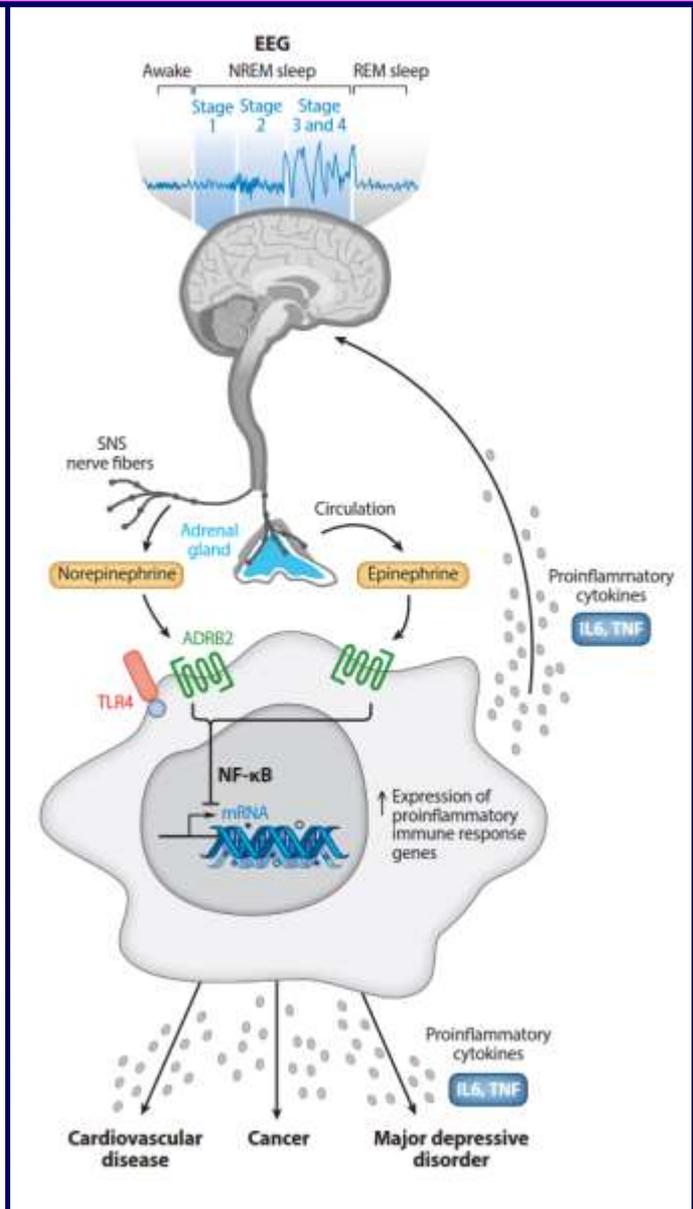
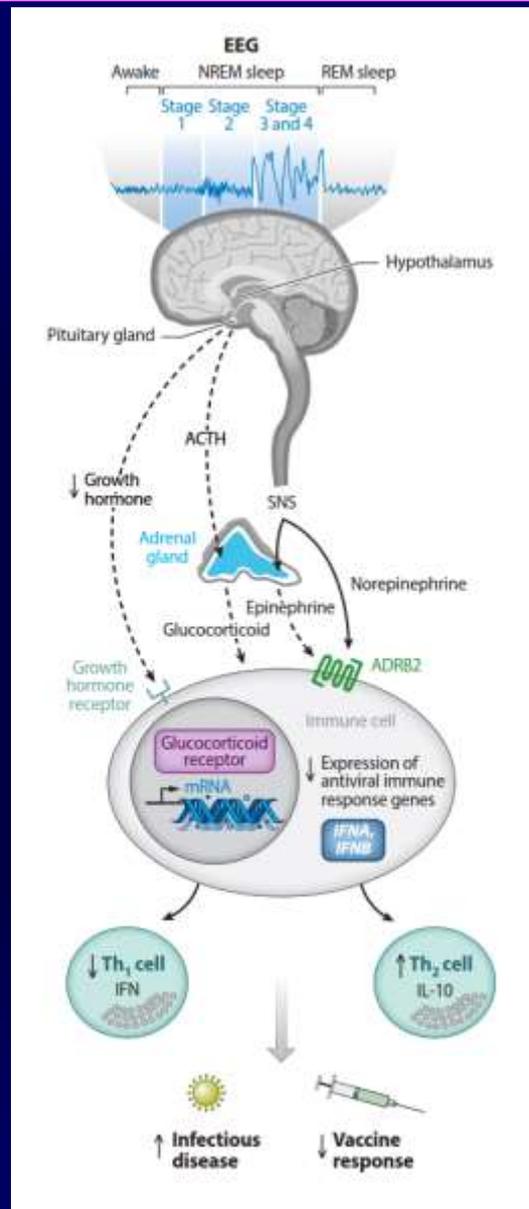


Fig. 1 Psychoneuroimmunology crosstalk. The brain communicates with the immune system, thereby influencing immune function (*red lines*: stimulating; *green lines*: inhibiting). The immune system communicates with the brain by reciprocal pathways. Both directions are linked to the development of diseases. This is mainly relevant when either psychological stress lasts too long or immune system activation is chronic. In both situations, physical and mental activity are low, which can lead to illness. RAA renin–angiotensin–aldosterone system, T3 triiodothyronine (active thyroid gland hormone)

Sleep Deprivation/ Disturbance and Immune Function

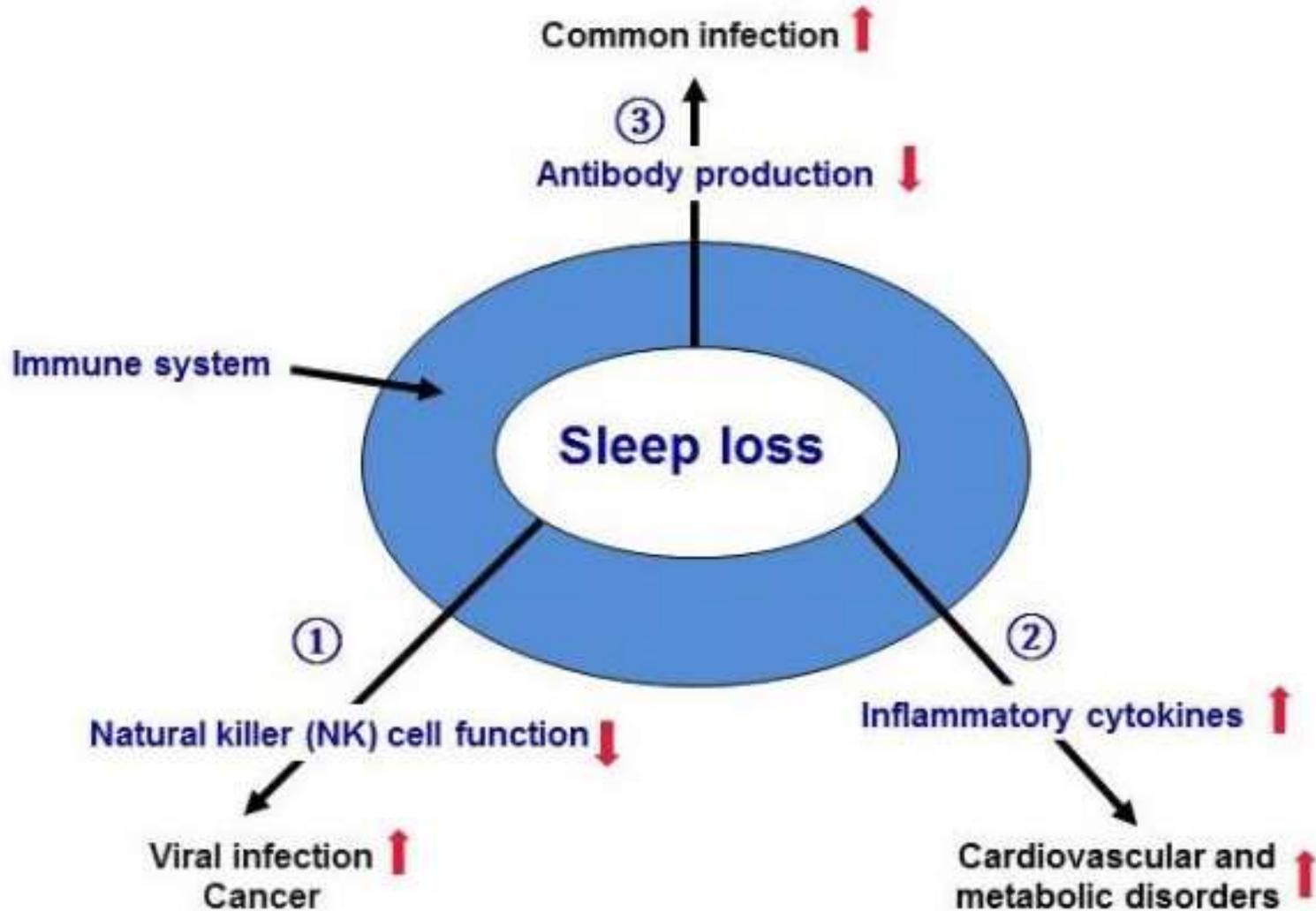
From: *Why sleep is important for health: a psychoneuroimmunology perspective*, Irwin MR, *Annual Review of Psychology* 66:143-72, 2015.

<https://www.annualreviews.org/doi/pdf/10.1146/annurev-psych-010213-115205>





Sleep & Immunity





Harvard Health Publishing HARVARD MEDICAL SCHOOL

Trusted advice for a healthier life

How to boost your immune system



Image: Izf/Getty Images

Helpful ways to strengthen your immune system and fight off disease

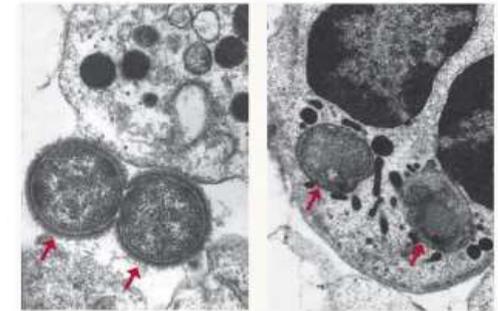
Updated: April 6, 2020 Published: September, 2014

How can you improve your immune system? On the whole, your immune system does a remarkable job of defending you against disease-causing microorganisms. But sometimes it fails: A germ invades successfully and makes you sick. Is it possible to intervene in this process and boost your immune system? What if you improve your diet? Take certain vitamins or herbal preparations? Make other lifestyle changes in the hope of producing a near-perfect immune response?

Healthy ways to strengthen your immune system

Your first line of defense is to **choose a healthy lifestyle**. Following general good-health guidelines is the single best step you can take toward naturally keeping your immune system strong and healthy. Every part of your body, including your immune system, functions better when protected from environmental assaults and bolstered by healthy-living strategies such as these:

- **Don't smoke.**
- Eat a diet high in fruits and vegetables.
- Exercise regularly.
- Maintain a **healthy weight**.
- If you drink alcohol, drink only in moderation.
- Get adequate sleep.
- **Take steps to avoid infection**, such as washing your hands frequently and cooking meats thoroughly.
- Try to minimize stress.



Immunity in action. A healthy immune system can defeat invading pathogens as shown above, where two bacteria that cause gonorrhea are no match for the large phagocyte, called a neutrophil, that engulfs and kills them (see arrows).

Photos courtesy of Michael N. Starnbach, Ph.D., Harvard Medical School

<https://www.health.harvard.edu/staying-healthy/how-to-boost-your-immune-system>

Yoga Practices

Postures, Breathing, Relaxation, Meditation

Fitness

↑Flexibility
↑Strength
↑Coordination/Balance
↑Respiratory Function
↑Self-Efficacy

Self-Regulation

↑Stress Regulation
↑Emotion Regulation
↑Resilience
↑Equanimity
↑Self-Efficacy

Awareness

↑Attention
↑Mindfulness
↑Concentration
↑Cognition
↑Meta-cognition

Spirituality

↑Unitive State
↑Transcendence
↑Flow
↑Transformation
↑Life Meaning/Purpose

Global Human Functionality

↑Physical & Mental Health, ↑Physical Performance
↑Stress & Emotion Regulation, ↑Awareness/Mindfulness, ↑Meta-cognition
↑Positive Behavior, ↑Wellbeing, ↑Values, ↑Life Purpose & Meaning, ↑Spirituality

Mind-Body Medicine and Immune System Outcomes: A Systematic Review

Helané Wahbeh^{1,2,*}, Ashley Haywood², Karen Kaufman², Noelle Harling² and Heather Zwickey²

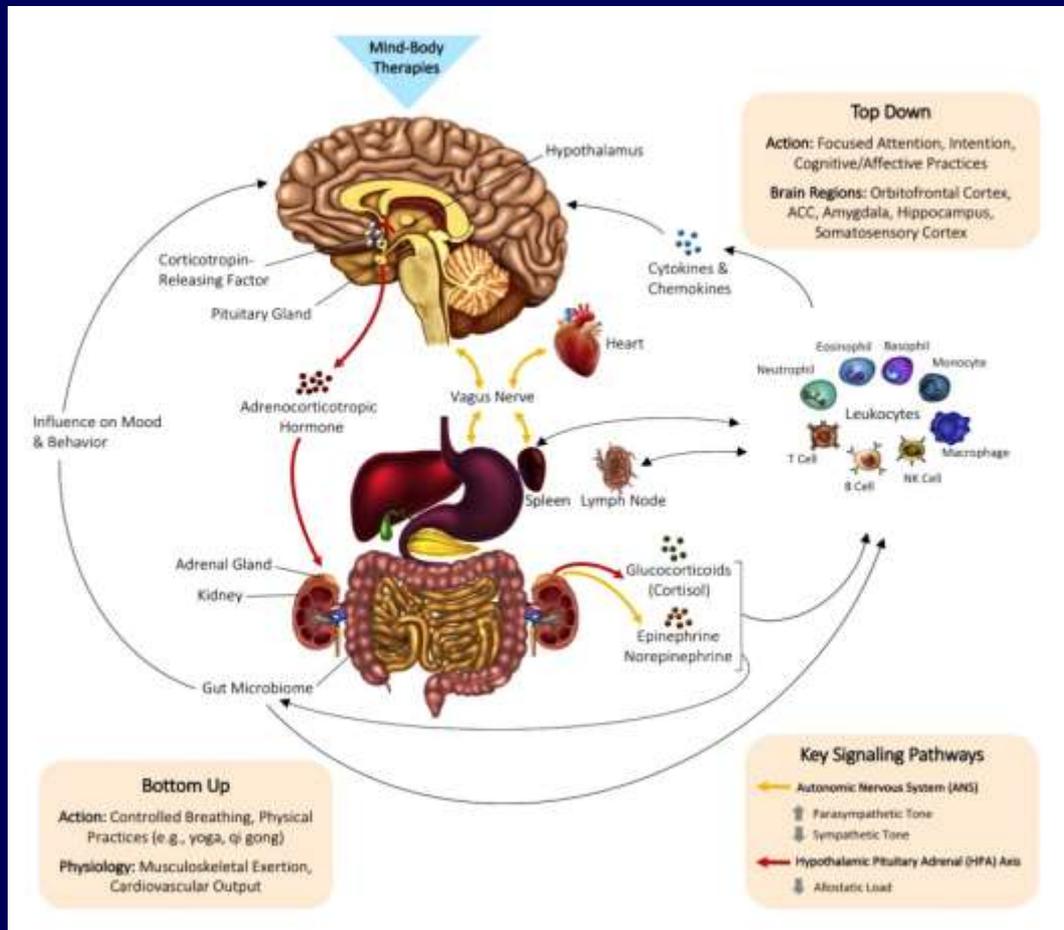
¹*Oregon Health & Science University, Portland, Oregon* and ²*Helfgott Research Institute, National College of Natural Medicine, Portland*

“111 studies with 4,777 subjects were reviewed, 81 of which were RCT’s. The three largest intervention type categories were Relaxation Training (n=25), Cognitive Based Stress Management (n=22), and Hypnosis (n=21). Half the studies were conducted with healthy subjects (n=51).”

“Relaxation training had the strongest scientific evidence for affecting immune outcomes.”

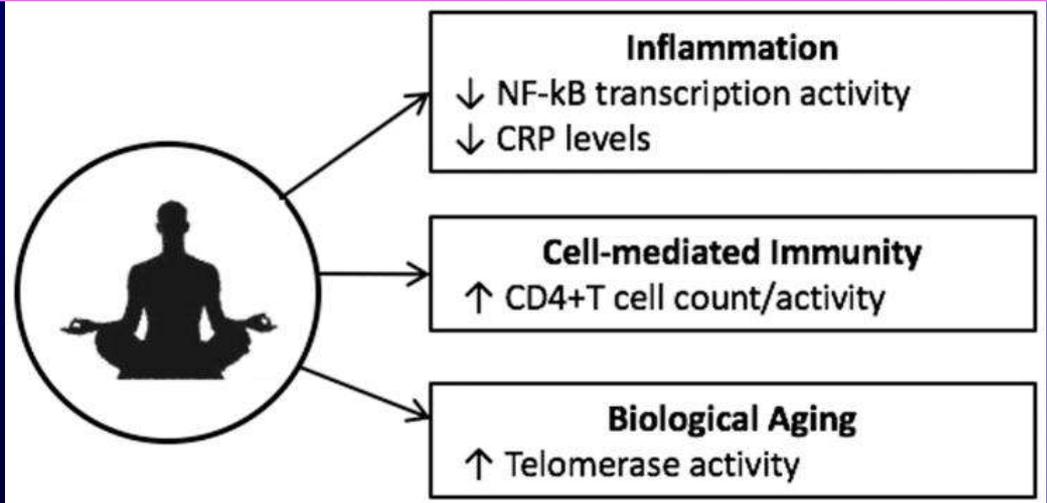
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3516431/pdf/nihms371487.pdf>

Mind Body Practices and Immunity



From: *The embodied mind: A review on functional genomic and neurological correlates of mind-body therapies.* Muehsam D, Lutgendorf S, Mills PJ, Rickhi B, Chevalier G, Bat N, Chopra D, Gurfein B, *Neuroscience and Biobehavioral Reviews*, 73:165-181, 2017.

Mindfulness Meditation and Immunity



“...across 20 RCTs and more than 1600 participants, we found tentative evidence that mindfulness meditation modulates some select immune parameters in a manner that suggests a more salutogenic immune profile. Specifically, mindfulness meditation appears to be associated with reductions in proinflammatory processes, increases in cell-mediated defense parameters...”

From: Mindfulness meditation and the immune system: a systematic review of randomized controlled trials. Black DS, Slavich GM, Annals of the New York Academy of Science, 1373:13-24, 2016.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4940234/pdf/nihms744023.pdf>

Modulation of immune responses in stress by Yoga

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¹Department of Biochemistry, Lady Hardinge Medical College

International Journal of Yoga • Vol. 1:2 • Jul-Dec-2008

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<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3144610/?report=printable>

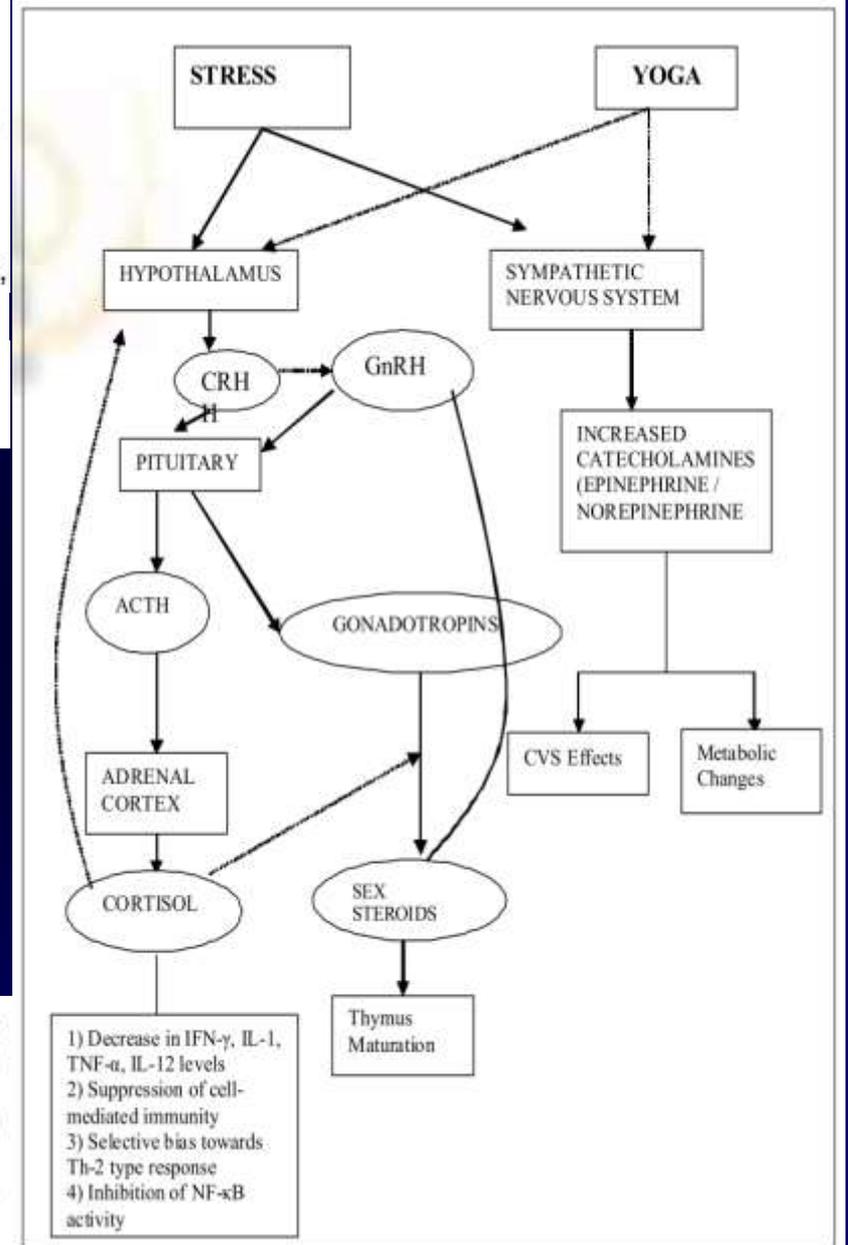


Figure 1: Neuroendocrine changes and the resultant immune responses associated with stress and the possible mechanism of action of Yoga. Solid lines indicate a stimulatory effect and dotted lines indicate an inhibitory effect. CRH: Corticotropin-Releasing Hormone, GnRH: Gonadotropin-releasing Hormone, ACTH: Adrenocorticotrophic Hormone, CVS: Cardiovascular system, IFN: Interferon, IL: Interleukin, TNF: Tumor Necrosis Factor, Th: T-helper, NF: Nuclear Factor

Yoga and immune system functioning: a systematic review of randomized controlled trials

R. I. Falkenberg^{1,4} · C. Eising² · M. L. Peters³

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Abstract Yoga is an ancient mind–body practice that is increasingly recognized to have health benefits in a variety of clinical and non-clinical conditions. This systematic review summarizes the findings of randomized controlled trials examining the effects of yoga on immune system functioning which is imperative to justify its application in the clinic. Fifteen RCTs were eligible for the review. Even though the existing evidence is not entirely consistent, a general pattern emerged suggesting that yoga can down-regulate pro-inflammatory markers. In particular, the qualitative evaluation of RCTs revealed decreases in IL-1beta, as well as indications for reductions in IL-6 and TNF-alpha. These results imply that yoga may be implemented as a complementary intervention for populations at risk or already suffering from diseases with an inflammatory component. Beyond this, yoga practice may exert further beneficial effects by enhancing cell-mediated and

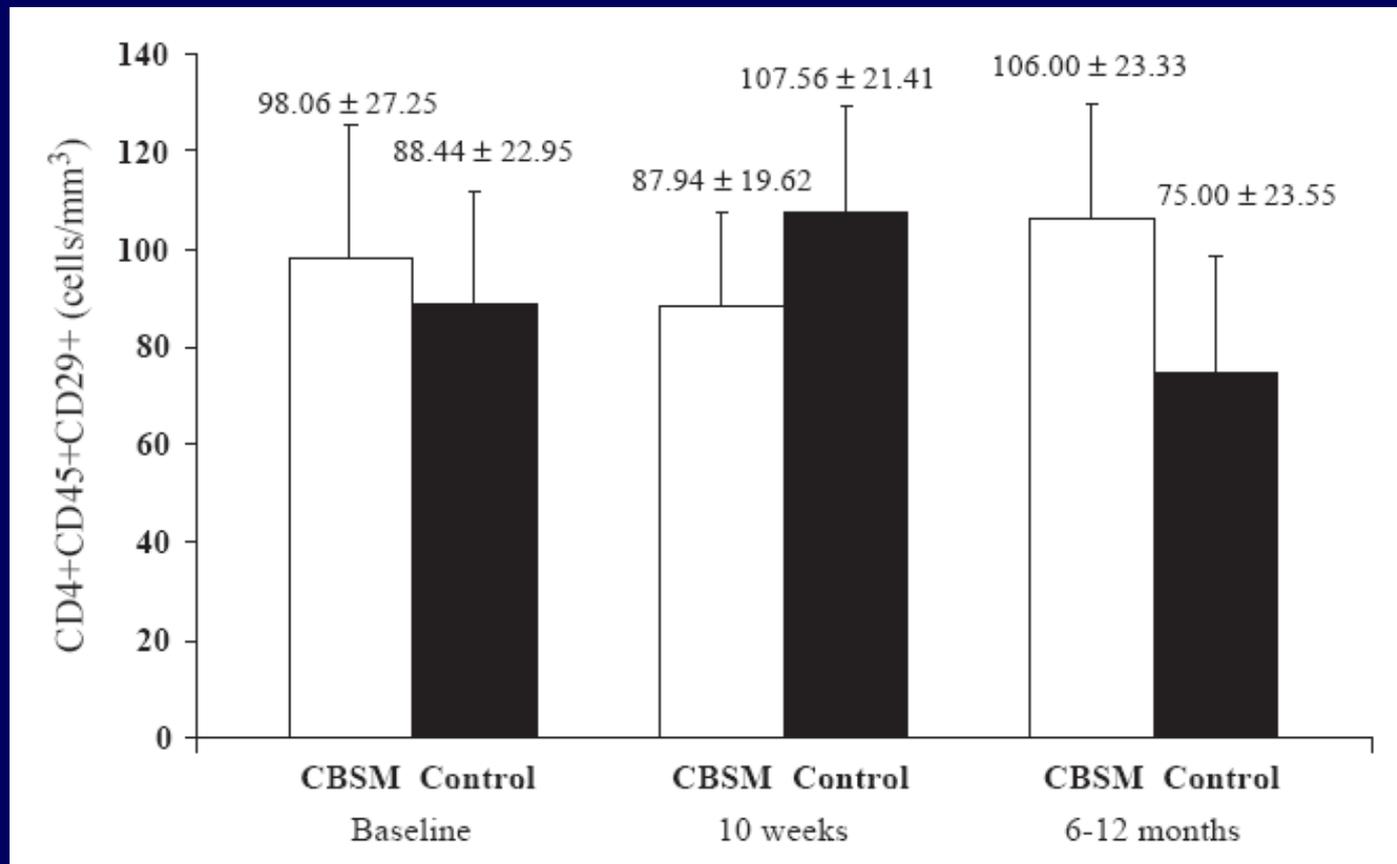
mucosal immunity. It is hypothesized that longer time spans of yoga practice are required to achieve consistent effects especially on circulating inflammatory markers. Overall, this field of investigation is still young, hence the current body of evidence is small and for most immune parameters, more research is required to draw distinct conclusions.

Keywords Yoga · Immune · Inflammation · Systematic review · Randomized controlled trials · Mind–body-therapy

Research Studies

Yoga & Immune Function

Mind-Body Intervention in HIV Patients

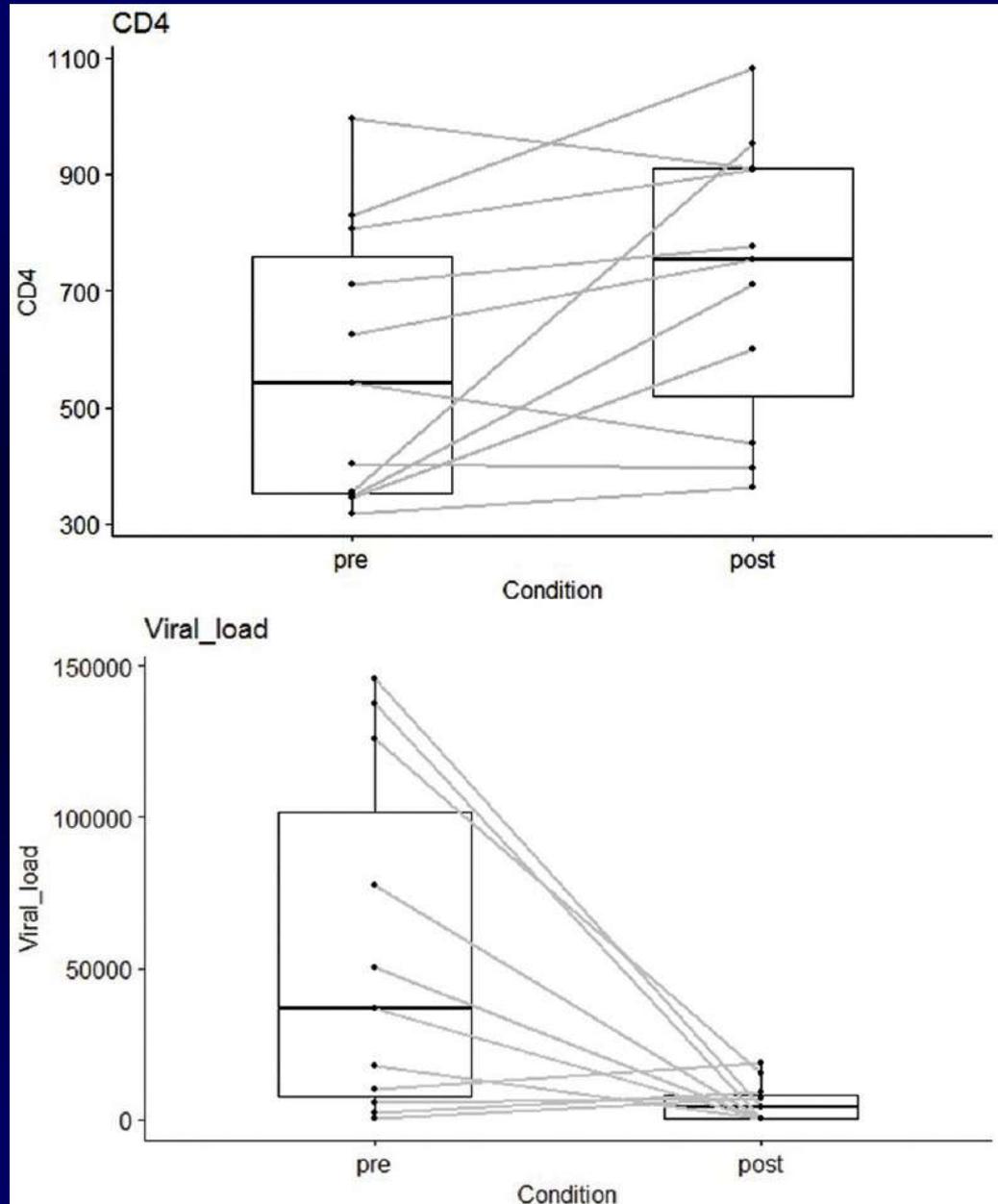


From: *Increases in a marker of immune system reconstitution are predated by decreases in 24-h urinary cortisol output and depressed mood during a 10-week stress management intervention in symptomatic HIV-infected men*, Antoni MH, Cruess DG, Klimas N, Carrico AW, Maher K, Cruess S, Lechner SC, Kumar M, Lutgendorf S, Ironson G, Fletcher MA, Schneiderman N., *Journal of Psychosomatic Research*, 58:3-13, 2005.

Yoga Improves Immune Function in HIV Patients

From: *Effect of Yoga on Immune Parameters, Cognitive Functions, and Quality of Life among HIV-Positive Children/Adolescents: A Pilot Study.* Hari Chandra BP, Ramesh MN, Nagendra HR, *International Journal of Yoga*, 12:132-138, 2019.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6521755/?report=printable>



MBSR on Immune Function in Cancer Patients

From: *Effect of mindfulness based stress reduction on immune function, quality of life and coping in women newly diagnosed with early stage breast cancer*. Witek-Janusek L, Albuquerque K, Chroniak KR, Chroniak C, Durazo-Arvizu R, Mathews HL, *Brain Behavior and Immunity*, 22:969-81, 2008.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2586059/pdf/nihms59851.pdf>

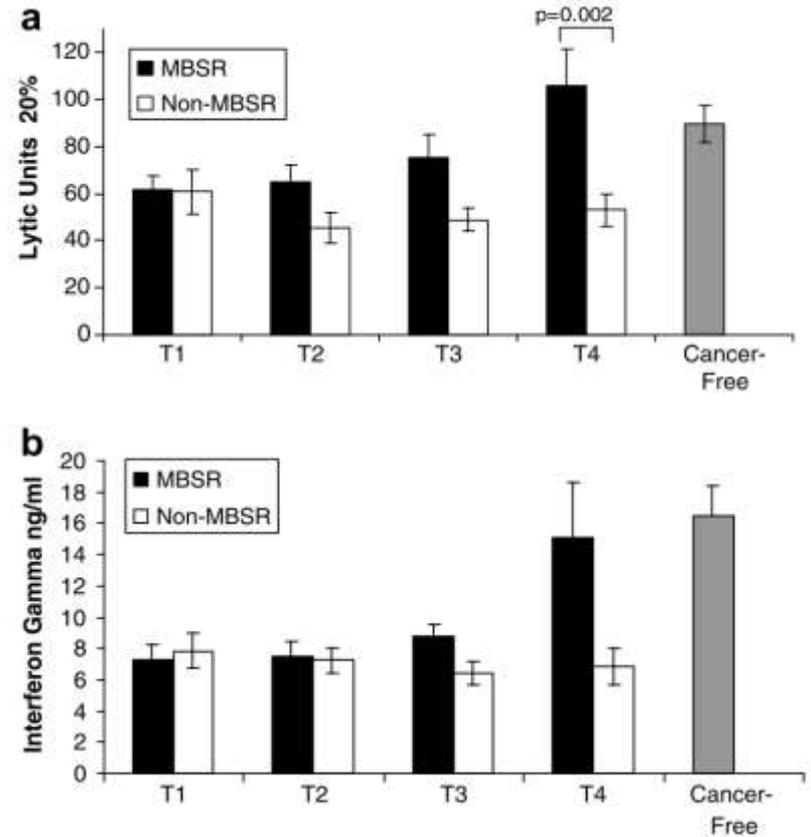
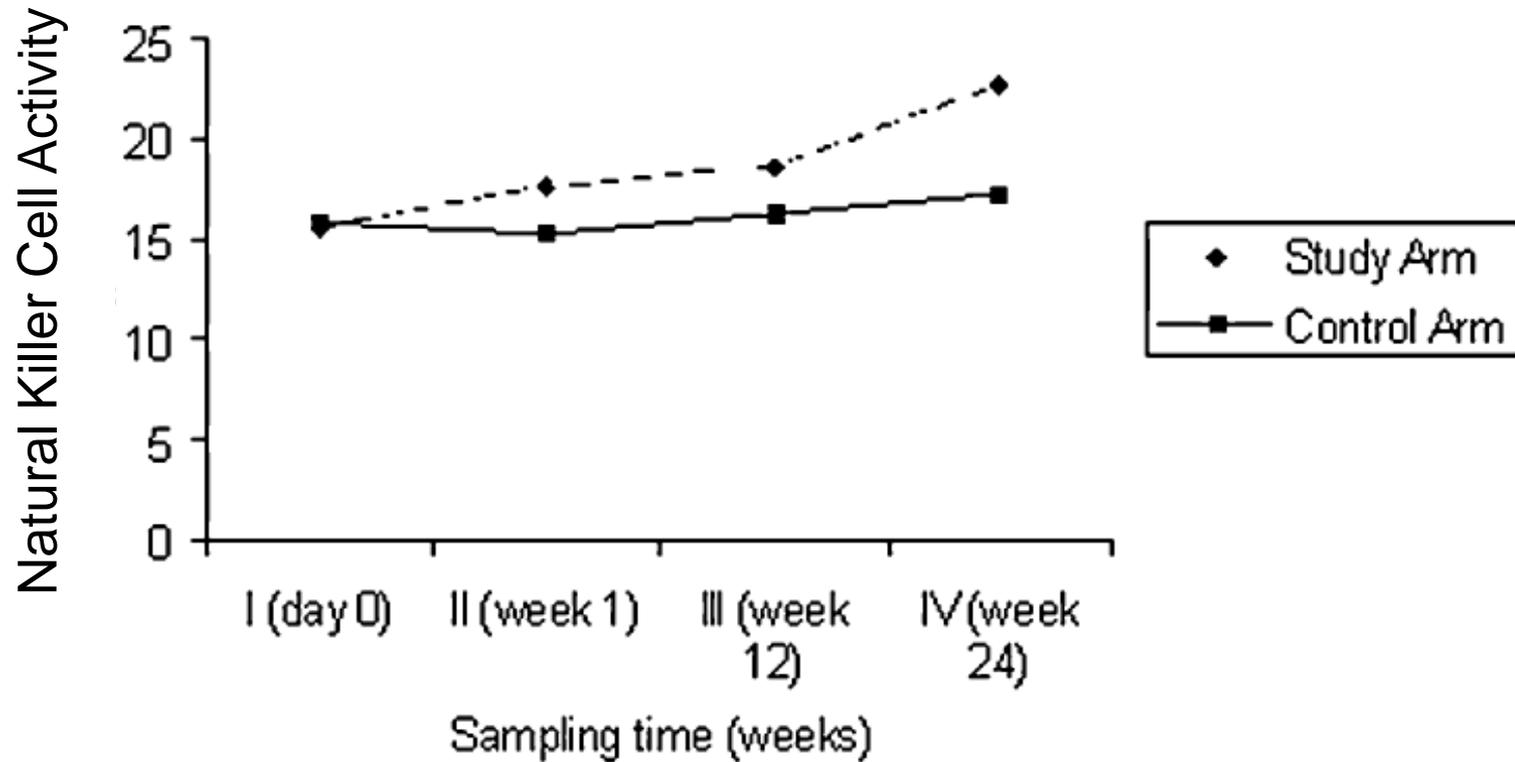


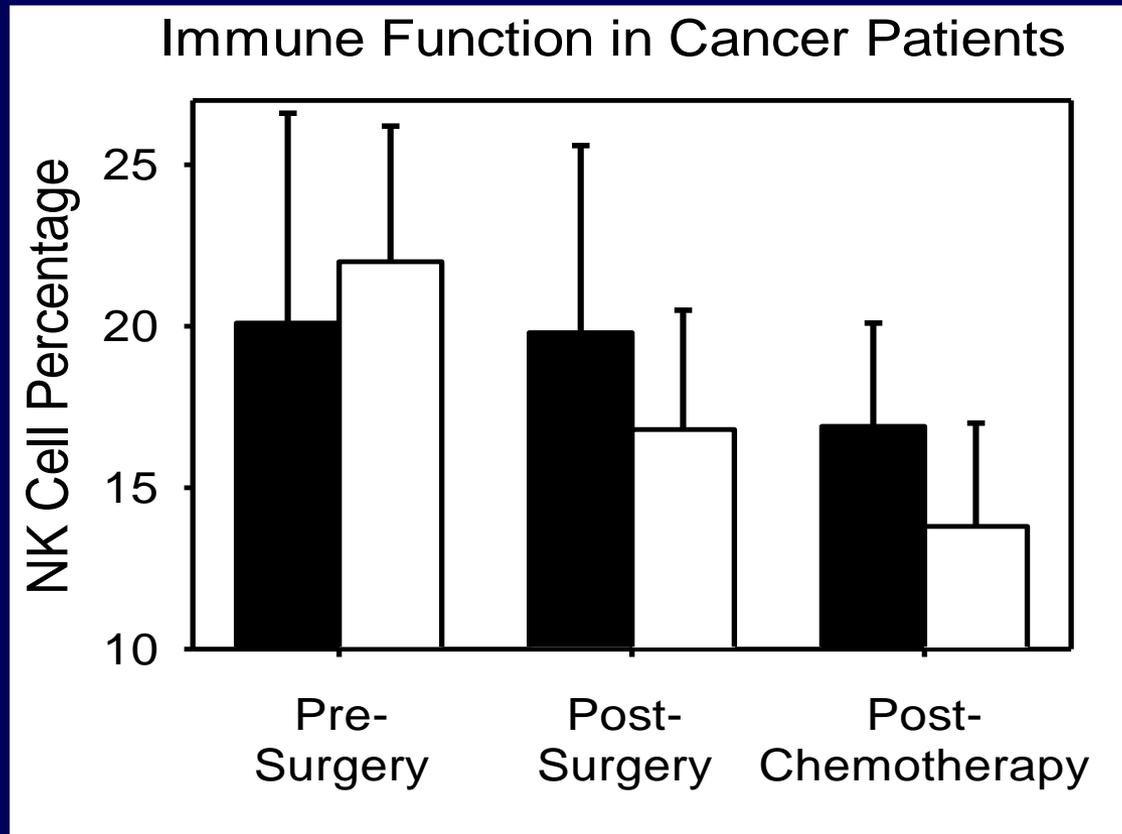
Fig. 2. (a) NKCA, expressed as lytic units at 20%, is illustrated for the MBSR and Non-MBSR groups, and for women without cancer (Cancer Free). Peripheral blood was collected and NKCA was measured using K562 tumor cells as the target. ANOVA: Time effect $p = 0.035$, Treatment effect $p = 0.010$, Interaction of Treatment \times Time $p = 0.018$. (b) PBMC production of IFN- γ is depicted for MBSR and Non-MBSR groups and for women without cancer (Cancer Free). Peripheral blood was collected, PBMC were activated with PMA/PHA and culture supernatants were collected at 48 h. Cytokine concentration was determined by ELISA. Repeated measures ANOVA; Treatment effect, $p = 0.001$ and Interaction of Treatment \times Time $p = 0.043$. Bars represent mean values \pm SEM.

Yoga and NK Cells in Cancer Patients



From: *Effect of rhythmic breathing (Sudarshan Kriya and Pranayam) on immune functions and tobacco addiction*, Kochupillai V, Kumar P, Singh D, Aggarwal D, Bhardwaj N, Bhutani M, Das SN, *Annals of the New York Academy of Sciences*, 2005.

Yoga and NK Cells Cancer Patients



From: *Effects of yoga on natural killer cell counts in early breast cancer patients undergoing conventional treatment.* Rao RM, Telles S, Nagendra HR, Nagarathna R, Gopinath K, Srinath S, Chandrashekara C, *Medical Science Monitor*, 14:LE3-4, 2008.

<https://www.medscimonit.com/download/index/idArt/734742>

Yoga and NK Cells in Cancer Patients

Table 4: Comparison of mean values of natural killer cell and absolute lymphocyte count levels using paired *t*-test and analysis of covariance

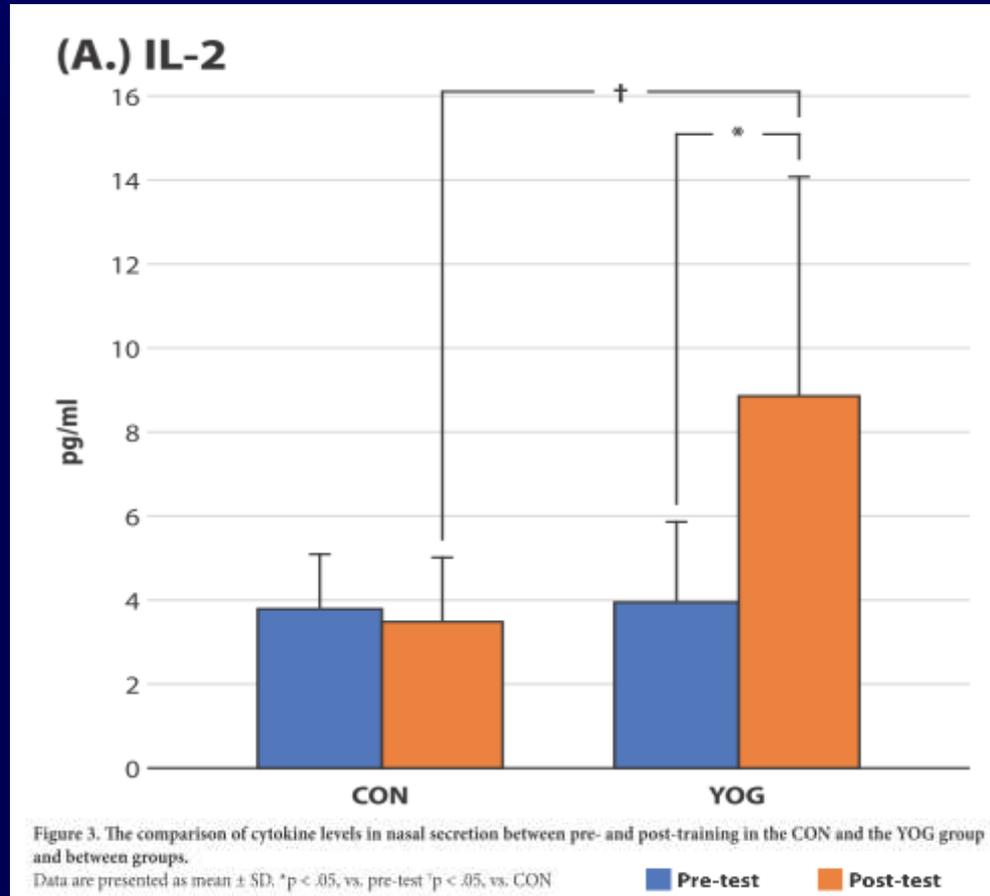
Outcome variable	Yoga (<i>n</i> =19), mean±SD			Control (<i>n</i> =15), mean±SD			Effect size (Cohen's <i>d</i>)	(Y-C) percentage
	Pre	Post	Percentage	Pre	Post	Percentage		
NK-cell count	209.21±123.12	213.16±125.31	1.89	192.73±130.39	181.47±109.07	-5.84	0.3	-7.73
NK %	9.68±4.28	11.32±4.92* [†]	16.94	10.33±5.61	8.73±5.55	-15.49	0.5	-32.43 [†]
ALC	2016.05±768.18	2041.26±853.73	1.25	1792.93±997.22	1829.93±797.73	2.06	0.3	0.81

**P*<0.05 for within group change using paired *t*-test, [†]*P*<0.05 for between group change using ANCOVA. NK: Natural killer, ALC: Absolute lymphocyte count, ANCOVA: Analysis of covariance, SD: Standard deviation

From: *Effect of Yoga on Sleep Quality and Neuroendocrine Immune Response in Metastatic Breast Cancer Patients*. Rao RM, Vadiraja HS, Nagaratna R, Gopinath KS, Patil S, Diwakar RB, Shahsidhara HP, Ajaikumar BS, Nagendra HR, *Indian Journal of Palliative Care*, 23:253-260, 2017.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5545949/?report=printable>

Yoga Improves Immune Function



From: *Effect of Hatha yoga training on rhinitis symptoms and cytokines in allergic rhinitis patients.* Chanta A, Klaewsongkram J, Mickleborough TD, Tongtako W, *Asian Pacific Journal of Allergy and Immunology*, Aug 18, 2019.

<http://apjai-journal.org/wp-content/uploads/2019/08/AP-260419-0547.pdf>

Rapid Systematic Review

How to cite this article: Singh S, Sharma N, Singh U, Singh T, Mangal DK, Singh V. Nasopharyngeal wash in preventing and treating upper respiratory tract infections: Could it prevent COVID-19? Lung India 2020;37:246-51.

Nasopharyngeal wash in preventing and treating upper respiratory tract infections: Could it prevent COVID-19?

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Figure 2: The neti-pot used for the nasal saline wash



Figure 3: Demonstration of the technique of nasal saline wash. The stream of saline water is flushed through one nostril and drained through the other with help of gravity; all throughout the process the person breathes through the mouth

“The technique of nasopharyngeal wash to prevent the virus from inhabiting and replicating in the nasal and pharyngeal mucosa has been suggested to be useful in reducing symptoms, transmission, and viral shedding in cases of viral acute respiratory tract infections. In rapid systematic review, we found studies showing some improvement in prevention and treatment of upper respiratory tract infections.”

http://www.lungindia.com/temp/LungIndia373246-4889091_133450.pdf

Jala Neti and Colds

Table 1. Perceptions of participants on a scale of 0–100

	Crossover trial			1 year follow-up		
	Before SNL	After SNL	p value	Control	1 year	p value
Nose problems	51	37	<0.0001	59	39	<0.0001
Dryness	18	14	0.0560	15	9	0.0183
Blocked/congested	39	31	0.0078	40	32	0.1065
Sinus problems	30	19	0.0010	30	21	0.1101
Runny nose	24	21	0.3129	27	15	0.0053
Nosebleeds	8	9	0.8830	12	7	0.0821
Post-nasal drip	14	12	0.4536	15	12	0.1230
Itchy/sneezing	25	21	0.0915	35	17	<0.0001
Poor sense of smell	22	20	0.2106	26	17	0.0275
Eye problems	27	28	0.6271	33	23	0.0240
Burning/itching	15	12	0.1502	21	10	0.0085
Dryness	16	13	0.1458	20	18	0.6832
Watering	12	11	0.8878	12	6	0.0322
Redness	17	16	0.4055	17	14	0.2407
Grittiness	21	20	0.7185	24	19	0.0960
General problems						
No energy	18	14	0.0518	28	19	0.0245
Headaches	18	14	0.1221	17	12	0.0582
Snoring	25	22	0.1135	27	17	0.0126
Sore throat	19	13	0.0898	17	11	0.0088
Frequent colds	18	12	0.0671	18	9	0.0263
General health	34	30	0.2238	28	25	0.2393
Getting to sleep	19	21	0.3283	19	21	0.4358
Waking up	51	47	0.2397	49	44	0.2275
Waking at night	48	40	0.0193	42	47	0.2756

Legend:

Nose, eye, & general problems	no problem = 0		some problems = 50		lots of problems = 100
Getting to sleep	easy = 0				difficult = 100
Waking at night	never = 0	sometimes = 33	often = 67		always = 100
Waking up	refreshed = 0				tired = 100
Specific symptoms	no problem = 0	minor problem = 25	quite annoying = 50	v. annoying = 75	require treatment = 100

From: *Acceptance and effects of nasal lavage in volunteer woodworkers.*
 Rabone SJ, Saraswati SB, *Occupational Medicine (London)*, 49:365-9, 1999.

<https://academic.oup.com/occmed/article-pdf/49/6/365/4183401/49-6-365.pdf>

Efficacy of Isotonic Nasal Wash (Seawater) in the Treatment and Prevention of Rhinitis in Children

Ivo Šlapak, MD; Jana Skoupá, MD; Petr Strnad, MD; Pavel Horník, MD

Arch Otolaryngol Head Neck Surg. 2008;134(1):67-74

“...we saw faster clearing of some nasal symptoms in the saline groups...nasal secretion, type of nasal secretion, nasal obstruction, and sore throat...we noted significantly lower consumption of nasal decongestants and mucolytics...”

“During the weeks after acute illness when preventive potential was assessed...reduction in URTIs were robust and consistent in a number of parameters, including rhinologic symptoms, medication consumption, reported illness, school absence, and complication rate.”

<https://jamanetwork.com/journals/jamaotolaryngology/fullarticle/221846>

Jala Neti and Colds

Reductions:

- illness duration 1.9 days ($p = 0.01$)
- over-the counter medications by 36% ($p = 0.004$)
- transmission within household by 35% ($p = 0.006$)
- viral shedding by $\geq 0.5 \log_{10}$ /day ($p = 0.04$)

“These finding along with the lower rate of symptomatic household contacts in the intervention arm suggest that HSNIG helps reduce viral replication. Since viruses are shed during breathing and speaking, measure that helps reduce viral shedding would help reduce transmission.”

From: *A pilot, open labelled, randomised controlled trial of hypertonic saline nasal irrigation and gargling for the common cold.* Ramalingam S, Graham C, Dove J, Morrice L, Sheikh A, *Scientific Reports*, 9:1015, 2019.

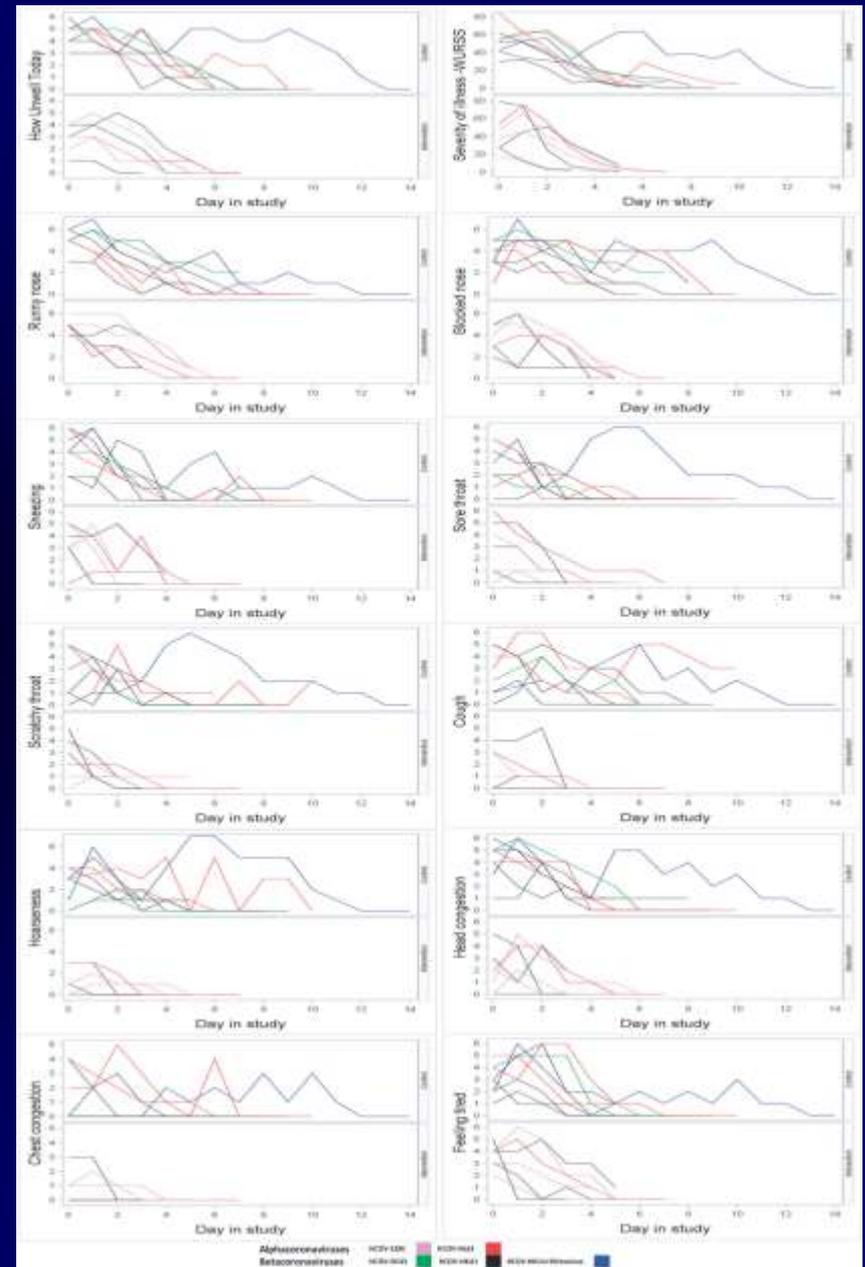
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6355924/pdf/41598_2018_Article_37703.pdf

Jala Neti & Coronavirus

The duration of illness was lower in the intervention arm...in the subset of patients infected with coronavirus (mean days: 5.6 vs 8.1...this was difference of -2.6 days... $P = 0.054$). The difference in the duration of blocked nose was -3.1 days... $P = 0.04$, cough -3.3 days... $P = 0.02$ and hoarseness of voice -2.9 days $p = 0.03$)...

From: *Hypertonic saline nasal irrigation and gargling should be considered as a treatment option for COVID-19. Ramalingam S, Graham C, Dove J, Morrice L, Sheikh A, Journal of Global Health, 10:010332, 2020.*

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7193539/pdf/jogh-10-010332.pdf>





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Scientific Research on Yoga

Substantial research has been done on many of the populations and parts of the body that COVID-19 preys on most. Use this section of Yoga Alliance's website to learn more about scientific research on the effects of yoga on the **elderly**, **respiratory function**, **anxiety**, and **depression**, to name a few.

Perhaps more than ever, yoga is being widely studied and evaluated for its positive effects and benefits. At Yoga Alliance, we curate the latest and most relevant research on yoga's applications in health, wellness, and disease. We have filtered it in a digestible manner for our Registered Yoga Schools and Registered Yoga Teachers as well as for the broader yoga community.

This evidence-based research not only reveals the science of yoga, it also explains its therapeutic efficacy when used in conjunction with conventional medicine. Our goal is that this impactful content will be utilized in a way that highlights even more of yoga's ancient, multi-faceted ability to improve lives.

Join us! Let us know how research on yoga is important or valuable to you on social media (@YogaAlliance) or by emailing us at research@yogaalliance.org. We honor and value your personal experiences and look forward to featuring your stories.

Our Research Conversation

Our Director of Yoga Research



Our Director of Yoga Research Dr. Sat Bir Singh Khalsa is a renowned yoga research expert and yoga teacher who has committed his professional life to clinical research surrounding yoga's full spectrum of healing efficacy.

[Learn More](#)

Featured Research Video



Learn about the process of aging and how yoga affects (and even slows down) aging.

[Watch Now](#)

Featured Health News



Visit our COVID-19 website, YourYA.org, for the most recent and applicable information on the coronavirus and the COVID-19 pandemic.

[Learn More](#)

Main Research Categories



[Basic Research](#)



[Special Populations](#)



[Disease and Disorders](#)

Archived Videos

Browse our selection of [yoga research videos](#) to learn more about research done in specific categories of health and wellness.

Psychophysiology Neurophysiology, Endocrinology, Neuroimaging, Gene Expression, Immune Function, Inflammatory Physiology, Metabolism

HOW TO READ THIS MATERIAL

Each citation is either:



A full-text article, or an abstract (summary) of a full-text article.



A Review Paper or Notable Publications.

Our hope is for yoga schools and yoga teachers to utilize this impactful content in their teachings to promote and highlight yoga's evident multi-faceted ability to improve lives. Let us know how research on yoga is important or valuable to you on social media (@YogaAlliance) or by emailing us at research@yogaalliance.org. We honor and value your personal experiences and look forward to featuring your stories.

These citations were curated by Yoga Alliance's Director of Yoga Research, Dr. [Sat Bir Singh Khalsa](#).

Main Research Categories



Basic Research



Special Populations



Disease and Disorders

Review Papers [\(What's this?\)](#)

Effects of Mind-Body Exercises (Tai Chi/Yoga) on Heart Rate Variability Parameters and Perceived Stress: A Systematic Review with Meta-Analysis of Randomized Controlled Trials.

Zou L, Sasaki JE, Wei GX, Huang T, Yeung AS, Neto OB, Chen KW, Hui SS.
J Clin Med. 2018 Oct 31;7(11).
[\[full text \]](#)

Yoga and immune system functioning: a systematic review of randomized controlled trials.

Falkenberg RI, Eising C, Peters ML.
J Behav Med. 2018 Aug;41(4):467-482.
[\[abstract \]](#)

A systematic review of psychoneuroimmunology-based interventions.

Moraes LJ, Miranda MB, Loures LF, Mainieri AG, Marmora CHC.
Psychol Health Med. 2018 Jul;23(6):635-652.
[\[abstract \]](#)

Yogic practices on oxidative stress and of antioxidant level: a systematic review of randomized controlled trials.

Notable Publications [\(What's this?\)](#)

Greater Anteroposterior Default Mode Network Functional Connectivity in Long-Term Elderly Yoga Practitioners.

Santaella DF, Balardin JB, Afonso RF, Giorjani GM, Sato JR, Lacerda SS, Amaro E Jr, Lazar S, Kozasa EH.
Front Aging Neurosci. 2019 Jul 2;11:158.
[\[full text \]](#)

Mind-Body Practices and the Self: Yoga and Meditation Do Not Quiet the Ego but Instead Boost Self-Enhancement.

Gebauer JE, Nehrlich AD, Stahlberg D, Sedikides C, Hackenschmidt A, Schick D, Stegmaier CA, Windfelder CC, Bruk A, Mander J.
Psychol Sci. 2018 Aug;29(8):1299-1308.
[\[abstract \]](#)

Differences in Brain Structure and Function Among Yoga Practitioners and Controls.

Gothé NP, Hayes JM, Temali C, Damoiseaux JS.
Front Integr Neurosci. 2018 Jun 22;12:26.
[\[full text \]](#)