



Brigham & Women's Hospital

Harvard Medical School



# Scientific Research on Yoga in the Global Health Care System, Part 2

**Yoga Alliance Webinar  
November 24, 2020**

Sat Bir S. Khalsa, Ph.D.

Assistant Professor of Medicine, Harvard Medical School

Director of Yoga Research, Yoga Alliance

Director of Research, Kundalini Research Institute

Editor in Chief, International Journal of Yoga Therapy

Research Associate, Benson Henry Institute for Mind Body Medicine

Research Affiliate, Osher Center for Integrative Medicine

# Non-communicable Diseases (NCDs) (Lifestyle Diseases/Chronic Diseases)

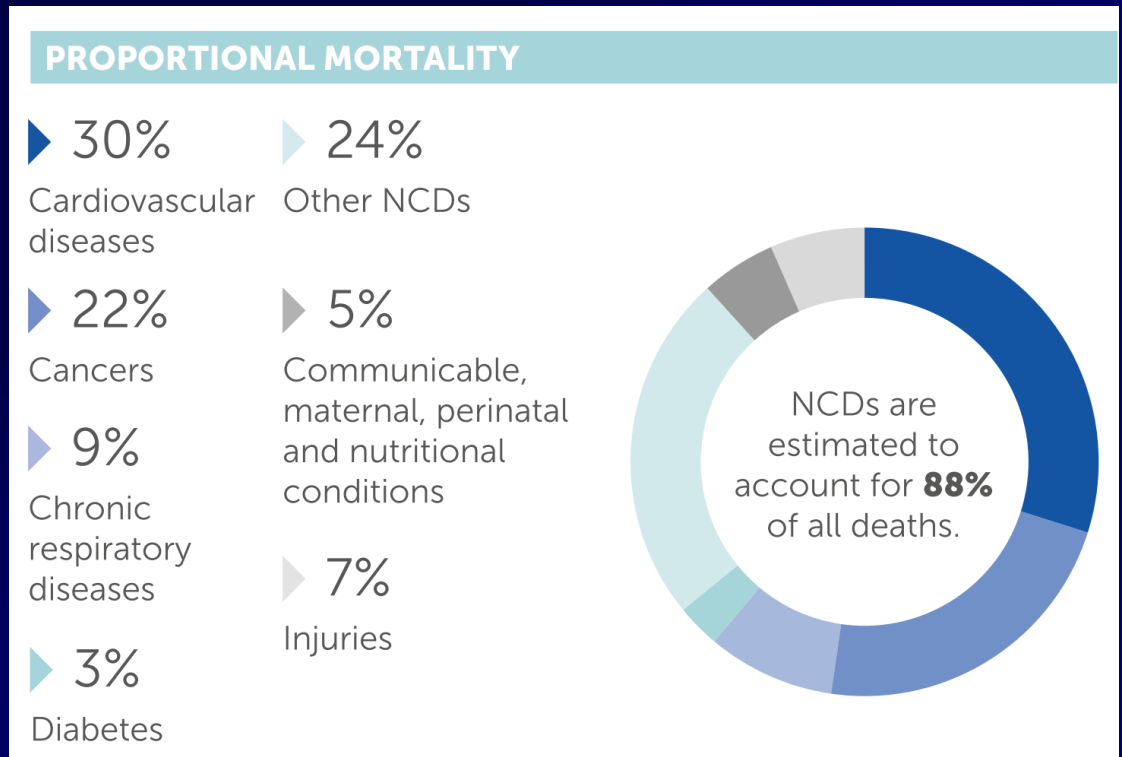
“NCDs are by far the leading cause of death worldwide. In 2016, they were responsible for 71% ... deaths which occurred globally.”

“The world is reaching an inflection point.”

“...15 million people will continue to die each year from NCDs in the prime of their lives...”

“Most of these deaths tomorrow can be avoided...”

*Noncommunicable Diseases, Country Profiles, World Health Organization, 2018*



[https://www.who.int/nmh/countries/2018/usa\\_en.pdf](https://www.who.int/nmh/countries/2018/usa_en.pdf)



## National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)

CDC > National Center for Chronic Disease Prevention and Health Promotion



Home National Center for Chronic Disease Prevention and Health Promotion

### About Chronic Diseases

Health and Economic Costs of Chronic Diseases

How You Can Prevent Chronic Diseases

About the Center

## About Chronic Diseases

**Six in ten adults** in the US have a chronic disease and **four in ten adults** have two or more.



HEART DISEASE



CANCER



CHRONIC LUNG DISEASE



STROKE



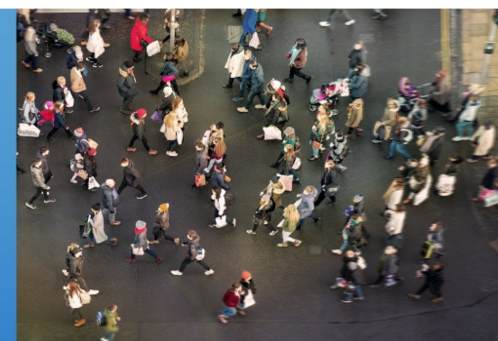
ALZHEIMER'S DISEASE



DIABETES



CHRONIC KIDNEY DISEASE



“90% of the nation’s \$3.3 trillion in annual health care expenditures are for people with chronic and mental health conditions”

<https://www.cdc.gov/chronicdisease/about/costs/index.htm>; accessed 6/14/19

Opioid overdoses accounted for more than 42,000 deaths in 2016, more than any previous year on record.

<https://www.hhs.gov/opioids/about-the-epidemic/index.html>; accessed 6/7/18

... significant increase in the percentage of Americans who had experienced at least one symptom of stress in the past month, from 71 percent in 2016 to 75 percent in 2017

<https://www.apa.org/news/press/releases/stress/2017/state-nation.pdf>

# **Risk Factors**

**Physical Inactivity**

**Unhealthy Diet**

**Unhealthy Behaviors**

**Chronic Stress**



# Health Behavior Change Following Chronic Illness in Middle and Later Life

Jason T. Newsom,<sup>1</sup> Nathalie Huguet,<sup>1</sup> Michael J. McCarthy,<sup>2</sup> Pamela Ramage-Morin,<sup>3</sup> Mark S. Kaplan,<sup>1</sup> Julie Bernier,<sup>3</sup> Bentson H. McFarland,<sup>4</sup> and Jillian Oderkirk<sup>3</sup>

<sup>1</sup>Institute on Aging and School of Community Health, Portland State University, Oregon.

<sup>2</sup>School of Social Work, University of Cincinnati, Ohio.

<sup>3</sup>Health Analysis Division, Statistics Canada, Ottawa, Ontario.

<sup>4</sup>Department of Psychiatry, Oregon Health and Science University, Portland.

**Objectives.** Understanding lifestyle improvements among individuals with chronic illness is vital for targeting interventions that can increase longevity and improve quality of life.

**Methods.** Data from the U.S. Health and Retirement Study were used to examine changes in smoking, alcohol use, and exercise 2–14 years after a diagnosis of heart disease, diabetes, cancer, stroke, or lung disease.

**Results.** Patterns of behavior change following diagnosis indicated that the vast majority of individuals diagnosed with a new chronic condition did not adopt healthier behaviors. Smoking cessation among those with heart disease was the largest observed change, but only 40% of smokers quit. There were no significant increases in exercise for any health condition. Changes in alcohol consumption were small, with significant declines in excessive drinking and increases in abstinence for a few health conditions. Over the long term, individuals who made changes appeared to maintain those changes. Latent growth curve analyses up to 14 years after diagnosis showed no average long-term improvement in health behaviors.

**Discussion.** Results provide important new information on health behavior changes among those with chronic disease and suggest that intensive efforts are required to help initiate and maintain lifestyle improvements among this population.

# The Acute Care Model

- Focused on treatment and/or intentional suppression of symptoms often with little attention to underlying causes and contributing factors
- Dominated by a disease-focused approach rather than a patient-centered holistic approach
- Highly invested in pharmaceutical, surgical and other highly technological diagnostic and treatment strategies
- Incentivized to emphasize speed, high volume, and immediate symptom relief
- Responsibility for healthcare is primarily on the provider
- Prevention and self-care/health maintenance is not emphasized

## 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

# **Risk Factors**

# **Yoga**

**Physical Inactivity**

**Unhealthy Diet**

**Unhealthy Behaviors**

**Chronic Stress**

**Fitness**

**Self-Regulation**

**Awareness**

**Spirituality**

# Mindfulness Facilitates Intention

“...mindful individuals are more likely to carry out their intentions than are less-mindful individuals”

“...heightened awareness and attention to inner experiences and environmental influences, characterizing mindful individuals, facilitate a successful translation of intentions into actions.”

“...strengthening the ability for self control, that is, the ability to stay focused on the fulfillment of plans and control counterintentional thoughts that often detract people from acting on their intentions.”

“...mindful individuals are more likely to exercise control over counterintentional habits than are less-mindful individuals.”

“...mindfulness shields intentions from counterintentional habits.”

*From: Mindfulness and the intention-behavior relationship within the theory of planned behavior.  
Chatzisarantis NL, Hagger MS, Personality & Social Psychology Bulletin, 33:663-76, 2007.*

<https://pubmed.ncbi.nlm.nih.gov/17440208/>

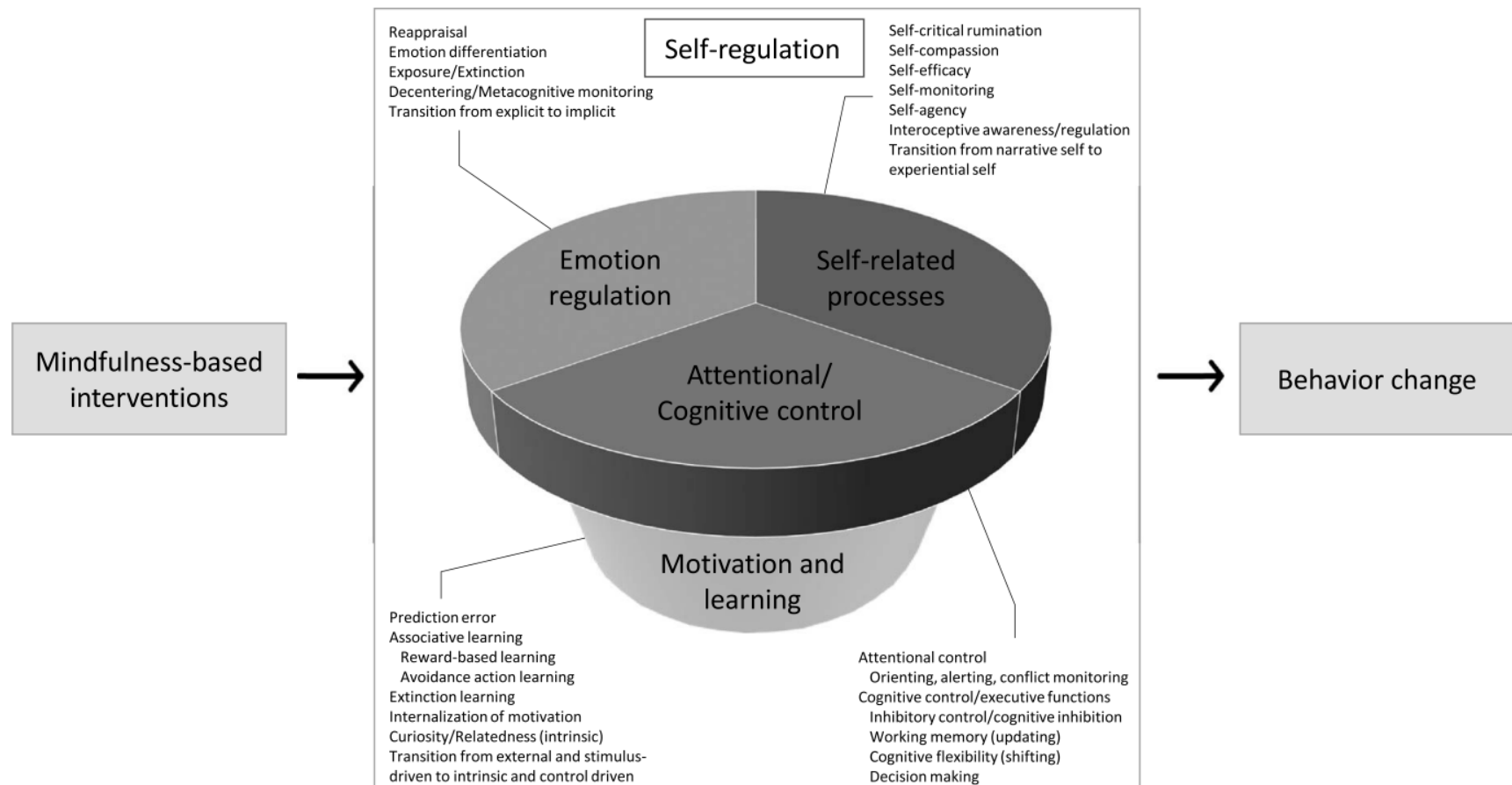
# Sustaining Lifestyle Behavior Change

“...enhancing mindfulness through mind-body practices (e.g. meditation, yoga) is related to improvements in lifestyle change...For example, noticing the effects of food on the body may influence the desire for an improved diet and result in weight loss (e.g. “I notice that I feel sluggish after eating fried food and would like to eat it less so that I am more able to concentrate on my work”)”

From: *Complementary Tools to Empower and Sustain Behavior Change: Motivational Interviewing and Mindfulness*. Sohl SJ, Birdee G, Elam R, *American Journal of Lifestyle Medicine*, 10:429-436, 2016.

[https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5319432/pdf/10.1177\\_1559827615571524.pdf](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5319432/pdf/10.1177_1559827615571524.pdf)

# Mindfulness and Behavior Change



**Figure 1.** Mindfulness influences on self-regulation and behavior change.

From: *Mindfulness and Behavior Change*. Schuman-Olivier Z, Trombka M, Lovas DA, Brewer JA, Vago DR, Gawande R, Dunne JP, Lazar SW, Loucks EB, Fulwiler C. *Harvard Review of Psychiatry* 28:371-394, 2020.

<https://pubmed.ncbi.nlm.nih.gov/33156156/>

# Mindfulness and Behavior Change

“A growing evidence base supports the benefits of mindfulness for behavior change. A mindful self-regulation model based on an integration of neuroscientific findings describes the complex and synergistic effects of attention/cognitive control, emotion regulation, and self-related processes, as well as motivation and learning mechanisms that may provide a unique pathway toward sustainable behavior change.”

From: *Mindfulness and Behavior Change*. Schuman-Olivier Z, Trombka M, Lovas DA, Brewer JA, Vago DR, Gawande R, Dunne JP, Lazar SW, Loucks EB, Fulwiler C. *Harvard Review of Psychiatry* 28:371-394, 2020.

<https://pubmed.ncbi.nlm.nih.gov/33156156/>



# Mindfulness, Reward and Behavior

“People often know what behaviors are healthy for them and yet struggle to change unhealthy behavior. Effortful self-control often fails, especially in times of stress, when self-regulatory regions of the prefrontal cortex “go offline”. In addition, the application of extrinsic rewards and punishments often leave one feeling controlled and undermines psychological well-being. In contrast, a more sustainable route to behavior change and well-being may begin with present-moment awareness of one’s actions and their effects—which entails observation of the very learning process that produces habitual behaviors in the first place.”

“...with the application of awareness, the reward value of behaviors can be more accurately assessed and updated, providing the opportunity for behavior to shift—in a less effortful and more pleasant way—toward that which is autonomously motivated and even intrinsically satisfying. If potato chips no longer are attractive (i.e., have a low reward value), people will have less difficulty resisting them than if they apply pressure to refrain from eating them. If exercising, eating healthily, and so on becomes valuable or enjoyable to people—that is, has a high reward value—they are more likely to engage in it.”

*From: Self-Regulation Without Force: Can Awareness Leverage Reward to Drive Behavior Change? Ludwig VU, Brown KW, Brewer JA. Perspective in Psychological Science 15:1382-1399, 2020.*

<https://pubmed.ncbi.nlm.nih.gov/32857672/>

# Mindfulness, Reward and Behavior

## Assessing the value of

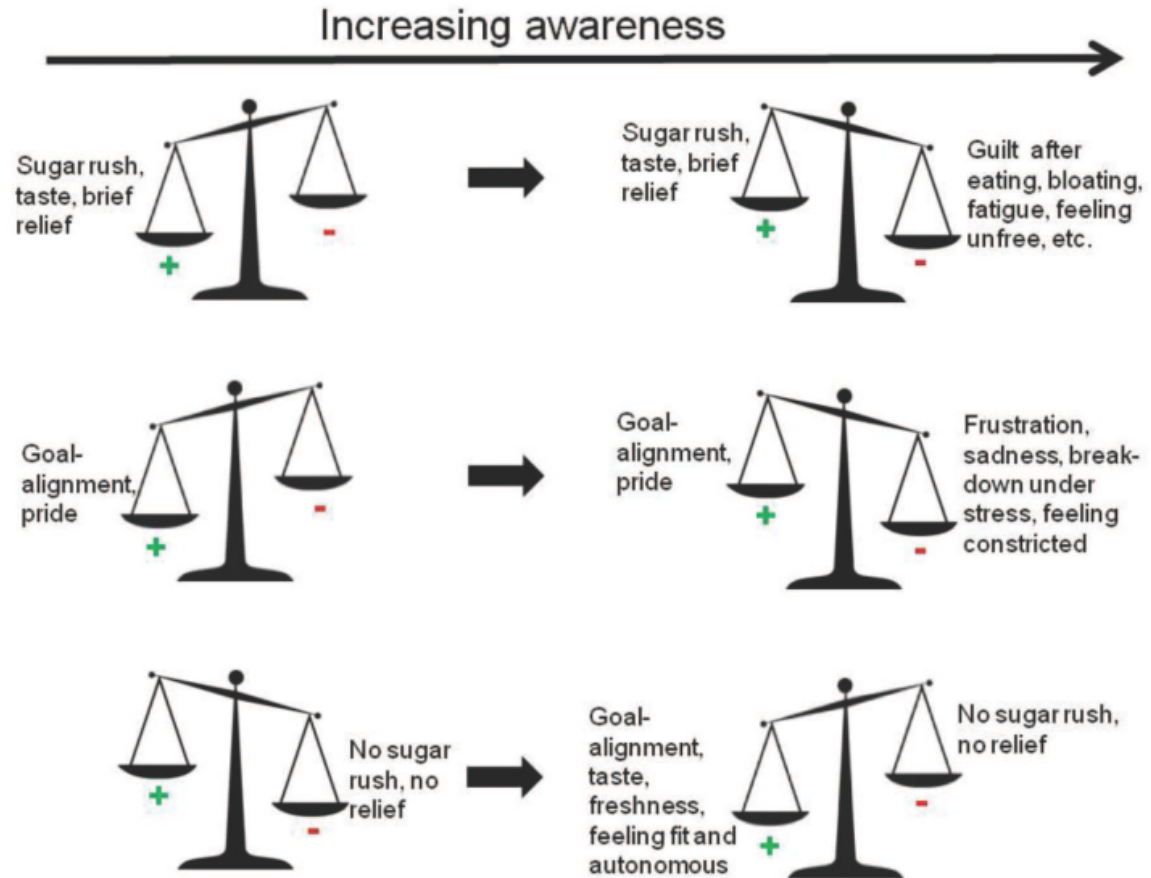
goal-misaligned, habitual behavior (Path A)



goal-aligned, forced behavior/restraint (Path B)



goal-aligned, autonomous behavior (Path C)



From: *Self-Regulation Without Force: Can Awareness Leverage Reward to Drive Behavior Change?* Ludwig VU, Brown KW, Brewer JA. *Perspective in Psychological Science* 15:1382-1399, 2020.

<https://pubmed.ncbi.nlm.nih.gov/32857672/>

# Yoga and Eating Behavior

“Participants who spent more time practicing yoga had greater body awareness and trait mindfulness. In contrast, increased time spent participating in cardio-based exercise was associated with lower trait mindfulness and was not related to body awareness. Yoga practice specifically incorporates mindfulness and promotes body awareness through a more direct experience of the body due to its process rather than outcome focus. Time spent doing yoga was also positively correlated with mindful eating.”

“...time spent practicing yoga was associated with fewer disordered eating tendencies, and this relationship was mediated by body awareness. Body awareness (being responsive to internal cues) may be a protective factor for maladaptive eating behaviors...”

*From: The role of body awareness and mindfulness in the relationship between exercise and eating behavior. Martin R, Prichard I, Hutchinson AD, Wilson C. Journal of Sport & Exercise Psychology 35:655-60, 2013.*

<https://pubmed.ncbi.nlm.nih.gov/24334325/>

# Mindfulness for Patient Behavior Change

“Large within-group effect sizes ( $d > 0.8$ ) for MTPC were observed for anxiety, mindfulness, self-compassion, and interoceptive awareness at both 8 and 24 weeks, and for emotion regulation at 24 weeks. Moderate-to-large within-group effect sizes ( $0.5 < d < 0.79$ ) were observed within MTPC for depression and stress at 8 and 24 weeks...”

“Of all randomized participants, 75% ( $n = 101$ ) made an action plan goal and reported level of initiation by week 9. The action plans related to mindfulness or self-care (45%), physical activity (31%), diet (8%), or other aspects impacting health or capacity for self-management of health condition (18%).”

“MTPC participants reported a higher rate of action plan initiation (API) compared with LDC.”

From: *Mindfulness Training Enhances Self-Regulation and Facilitates Health Behavior Change for Primary Care Patients: a Randomized Controlled Trial*. Gawande R, To MN, Pine E, Griswold T, Creedon TB, Brunel A, Lozada A, Loucks EB, Schuman-Olivier Z. *Journal of General Internal Medicine* 34:293-302, 2019.

[https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6374253/pdf/11606\\_2018\\_Article\\_4739.pdf](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6374253/pdf/11606_2018_Article_4739.pdf)

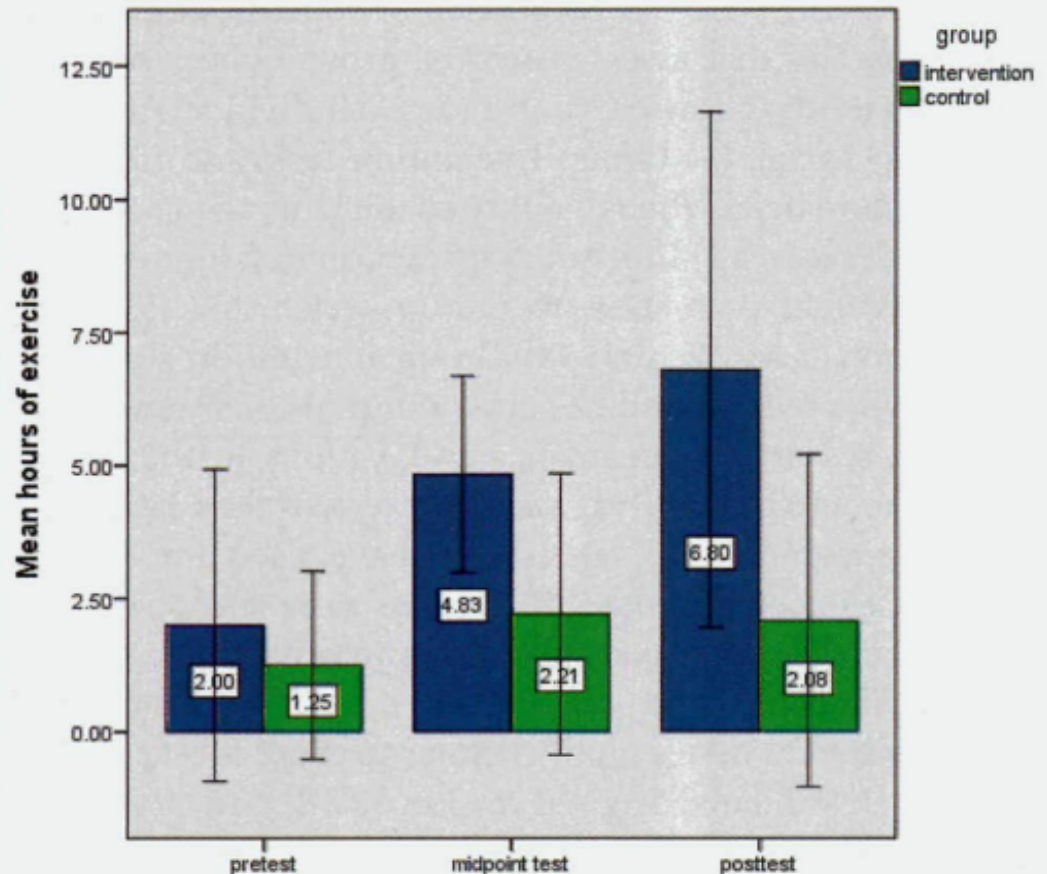
# Yoga for Exercise Adherence

“The acute-feeling responses to the yoga classes were favorable and may have been a key contributor to participants' improved perceptions of ability, which may have further fostered adherence.”

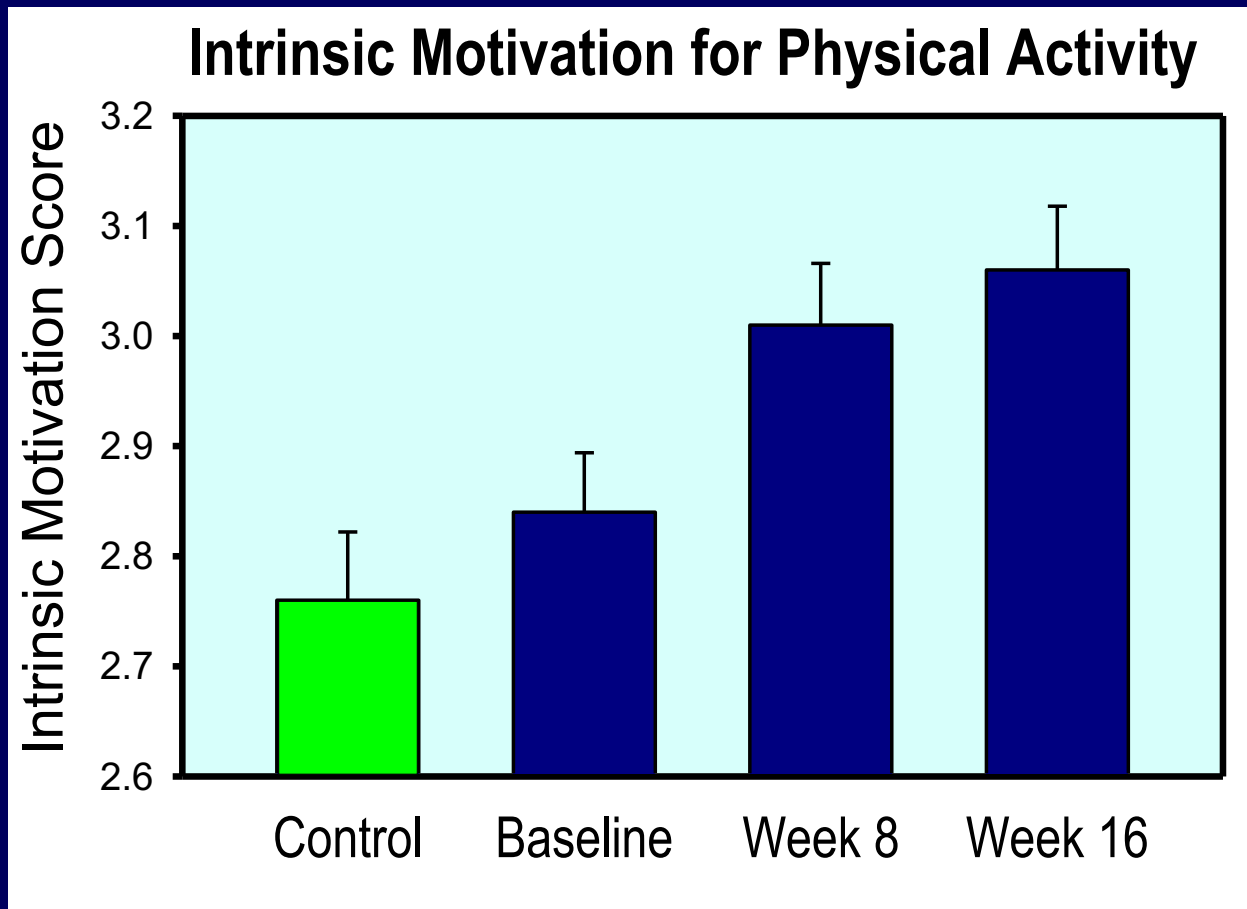
“The participants reported an increased self-awareness as a result of their experience.”

*From: The effects of yoga on psychosocial variables and exercise adherence: a randomized, controlled pilot study, Bryan S, Pinto Zipp G, Parasher R, Alternative Therapies in Health and Medicine, 18:50-9, 2012.*

**Figure 1.** Exercise Adherence Data by Time and Group



# Yoga for Physical Activity Motivation



*From: The roles of self-compassion, body surveillance, and body appreciation in predicting intrinsic motivation for physical activity: Cross-sectional associations, and prospective changes within a yoga context. Cox AE, Ullrich-French S, Tylka TL, McMahon AK. Body Image 29:110-117. 2019.*

<https://pubmed.ncbi.nlm.nih.gov/30921763/>

# **Yoga for NCD's**

## **Treatment**

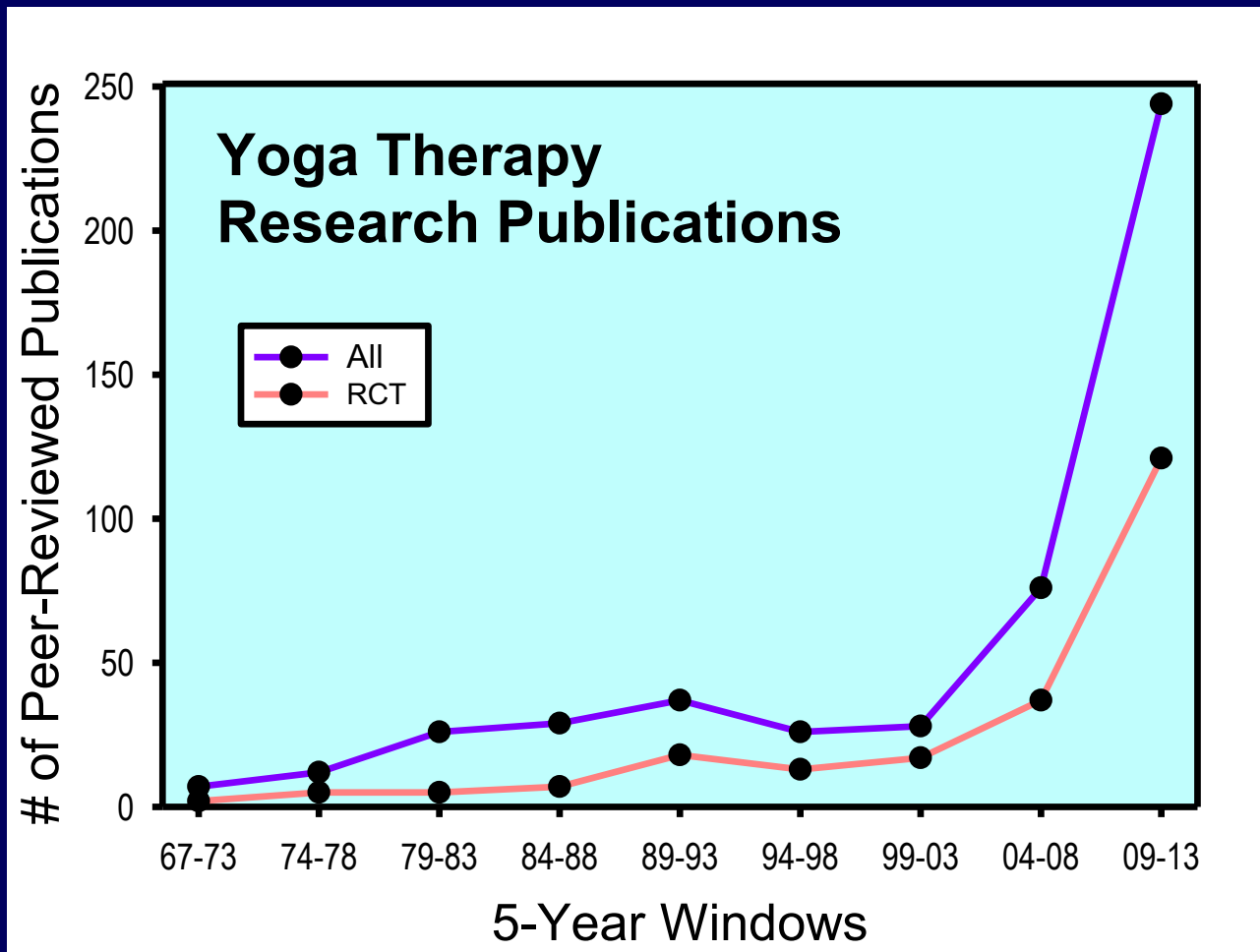
## **Prevention**

# **Yoga for NCD's**

## **Treatment**

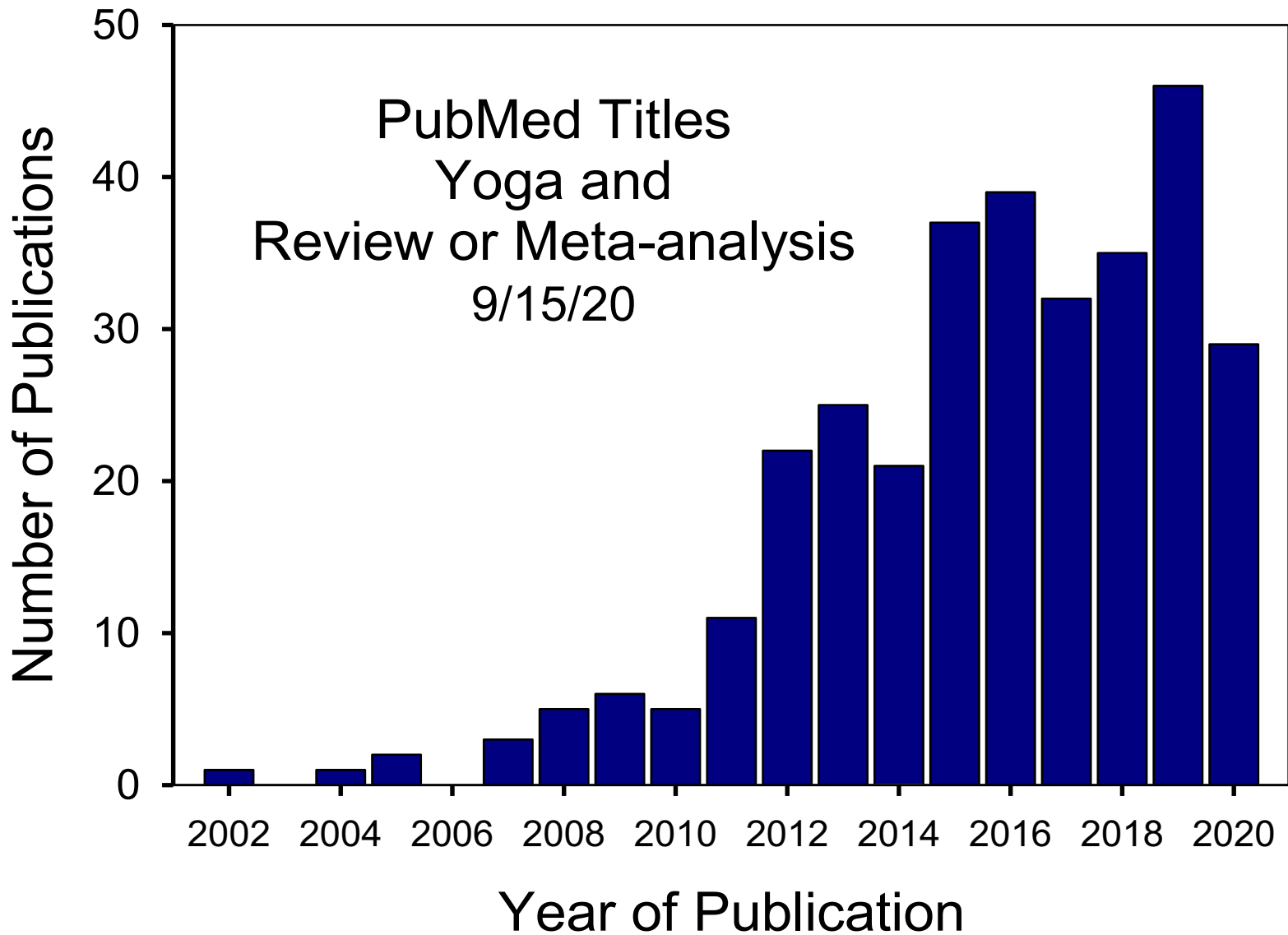


# Chronology of Yoga Therapy Research



From: *Yoga as a therapeutic intervention: A bibliometric analysis of published research studies from 1967-2013*, Jeter PE, Slutsky J, Singh N, Khalsa SBS, *Journal of Alternative and Complementary Medicine*, 21:586-92, 2015.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4605382/pdf/acm.2015.0057.pdf>



## THE PRINCIPLES AND PRACTICE OF YOGA IN HEALTH CARE



Sat Bir Khalsa



Lorenzo Cohen



Timothy McCall



Shirley Telles

**The Principles and Practice of Yoga in Health Care** is a professional-level textbook with contributions by multiple expert researchers and therapists in the field.

### This book

- brings together the science and the practice of yoga therapy
- supports the emergence of yoga therapy as a credible profession
- comprehensively summarizes research findings and their practical implications for professionals who use yoga or refer patients for yoga practice
- includes chapter contributions by leading biomedical researchers of yoga
- reviews the scientific evidence base for yoga for a wide variety of medical conditions
- Provides brief contributions by expert yoga therapists describing practical implementation issues relevant to yoga for specific conditions.

The editors include three eminent yoga therapy researchers and one renowned practitioner in the field. They have brought together an experienced team of researchers and yoga therapist contributors.

This book will prove essential to yoga therapists, physical therapists, medical doctors, psychologists and other health professionals interested in yoga as a therapeutic intervention.

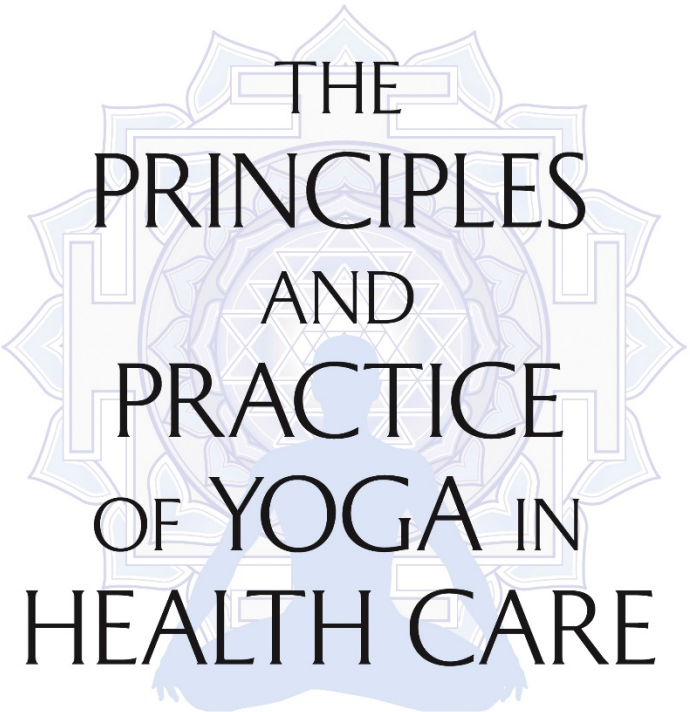


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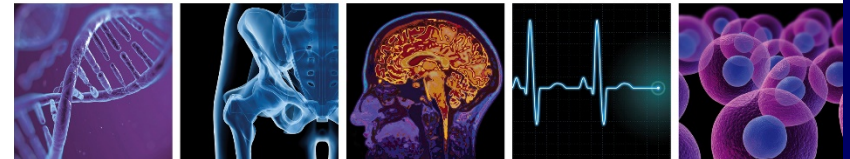


THE PRINCIPLES AND PRACTICE OF YOGA IN HEALTH CARE

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# THE PRINCIPLES AND PRACTICE OF YOGA IN HEALTH CARE



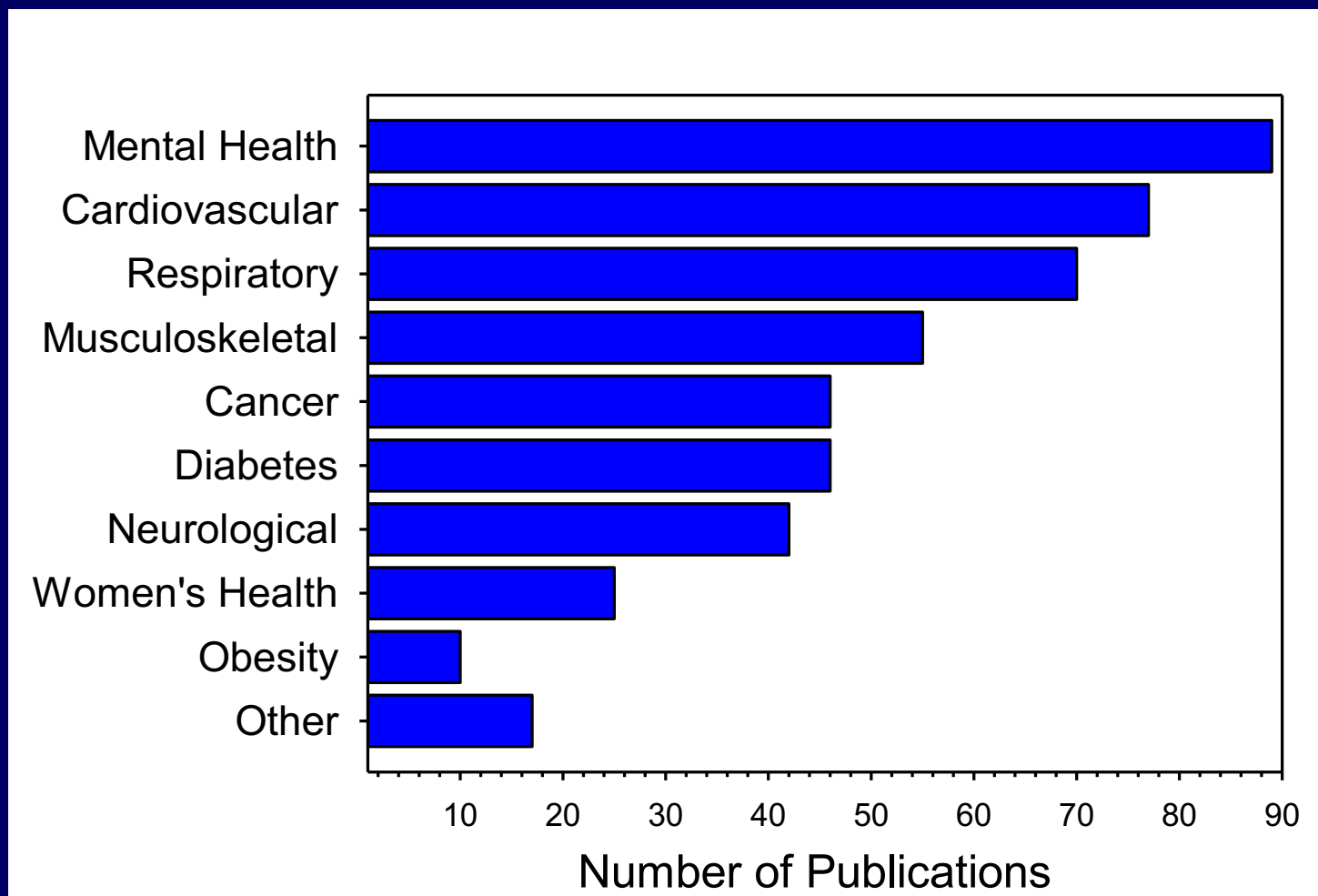
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- 23 chapters with theory, rationale, research & practice
- ~60 chapter contributors, ~30 yoga therapist contributors

<https://www.handspringpublishing.com/product/principles-practice-yoga-health-care/>

# Yoga Therapy Research by Disorders



From: *Yoga as a therapeutic intervention: A bibliometric analysis of published research studies from 1967-2013*, Jeter PE, Slutsky J, Singh N, Khalsa SBS, *Journal of Alternative and Complementary Medicine*, 21:586-92, 2015.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4605382/pdf/acm.2015.0057.pdf>

## Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians

Amir Qaseem, MD, PhD, MHA; Timothy J. Wilt, MD, MPH; Robert M. McLean, MD; and Mary Ann Forciea, MD; for the Clinical Guidelines Committee of the American College of Physicians\*

**Recommendation 2:** *For patients with chronic low back pain, clinicians and patients should initially select nonpharmacologic treatment with exercise, multidisciplinary rehabilitation, acupuncture, mindfulness-based stress reduction (moderate-quality evidence), tai chi, **yoga**, motor control exercise, progressive relaxation, electromyography biofeedback, low-level laser therapy, operant therapy, cognitive behavioral therapy, or spinal manipulation (low-quality evidence). (Grade: strong recommendation)*

<https://www.acpjournals.org/doi/full/10.7326/M16-2367>



Version 2.0 – 2017

Based on evidence reviewed through October 21, 2016



# VA/DoD CLINICAL PRACTICE GUIDELINE FOR DIAGNOSIS AND TREATMENT OF LOW BACK PAIN

Sidebar B: Interventions			
Category	Intervention	Low Back Pain Duration	
		Acute < 4 Weeks	Subacute or Chronic > 4 Weeks
Self-care	Advice to remain active	X	X
	Books, handout	X	X
	Application of superficial heat	X	
Non-pharmacologic therapy	Spinal manipulation		X
	Clinician-guided exercise		X
	Acupuncture		X
	CBT and/or mindfulness-based stress reduction		X
	Exercise which may include Pilates, tai chi, and/or yoga		X
Pharmacologic therapy	NSAIDs	X	X
	Non-benzodiazepine skeletal muscle relaxants	X	
	Antidepressants (duloxetine)		X
Other therapies	Intensive interdisciplinary rehabilitation		X

Abbreviations: CBT: cognitive behavioral therapy; NSAIDs: nonsteroidal anti-inflammatory drugs

<https://www.healthquality.va.gov/guidelines/Pain/lbp/VADoDLBPCPG092917.pdf>

**SPECIAL ARTICLE**

## Cancer-related fatigue: ESMO Clinical Practice Guidelines for diagnosis and treatment<sup>†</sup>

A. Fabi<sup>1</sup>, R. Bhargava<sup>2</sup>, S. Fatigoni<sup>3</sup>, M. Guglielmo<sup>4</sup>, M. Horneber<sup>5</sup>, F. Roila<sup>3</sup>, J. Weis<sup>6</sup>, K. Jordan<sup>7</sup> & C. I. Ripamonti<sup>4</sup>, on behalf of the ESMO Guidelines Committee\*

Volume 31 ■ Issue 6 ■ 2020

<https://doi.org/10.1016/j.annonc.2020.02.016>

**713**

### *Recommendations*

- Information and counselling are recommended in cancer patients and their caregivers to help them in understanding CRF and to educate them about ways to either prevent fatigue, avoid it becoming a chronic condition or to manage it [II, B].
- Psychoeducation is recommended to manage CRF [II, B].
- CBT is recommended to manage CRF [II, B].
- MBSR could be an option to improve CRF [II, C].
- Yoga could be an option to improve CRF in cancer survivors and QoL [II, C].
- Concerning the use of acupuncture, the panel has not reached a consensus:
  - for three panel members, it could be an option [II, C]
  - for the other six panel members, it cannot be recommended [II, D].

<https://pubmed.ncbi.nlm.nih.gov/32173483/>



## Integrative Therapies During and After Breast Cancer Treatment: ASCO Endorsement of the SIO Clinical Practice Guideline

*Gary H. Lyman, Heather Greenlee, Kari Bohlke, Ting Bao, Angela M. DeMichele, Gary E. Deng, Judith M. Fouladbakhsh, Brigitte Gil, Dawn L. Hershman, Sami Mansfield, Dawn M. Mussallem, Karen M. Mustian, Erin Price, Susan Rafte, and Lorenzo Cohen*

### American Society for Clinical Oncology (ASCO)

“Music therapy, meditation, stress management, and **yoga** are recommended for anxiety/stress reduction. Meditation, relaxation **yoga**, massage, and music therapy are recommended for depression/mood disorders. Meditation and **yoga** are recommended to improve quality of life.”

<https://pubmed.ncbi.nlm.nih.gov/29889605/>



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## Medicare covers yoga for heart disease

By **William Hudson**, CNN

updated 6:26 PM EST, Mon February 27, 2012

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Medicare covers yoga for heart disease

### STORY HIGHLIGHTS

- Dean Ornish Program for Reversing Heart Disease is covered by Medicare
- Patients do yoga, eat a plant-based, meatless diet and

(CNN) -- Frank Korona lives near the West Virginia-Pennsylvania border with his wife Kathy, in a house that he built with his own hands, on the same property where he grew up.

He served in the Army Special Forces in Vietnam. The Koronas have a long, proud tradition of military service, but their family's

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# NCCIH Events

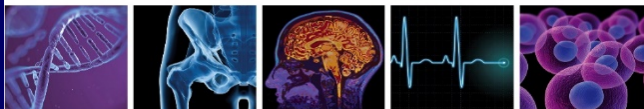


# **Yoga for NCD's**

## **Prevention**



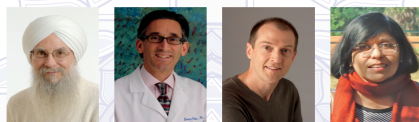
# THE PRINCIPLES AND PRACTICE OF YOGA IN HEALTH CARE



Sat Bir Khalsa • Lorenzo Cohen  
Timothy McCall • Shirley Telles



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**The Principles and Practice of Yoga in Health Care** is a professional-level textbook with contributions by multiple expert researchers and therapists in the field.

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THE PRINCIPLES AND PRACTICE OF YOGA IN HEALTH CARE

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## CHAPTER TWENTY-ONE YOGA FOR PREVENTION AND WELLNESS

A ROSS • A MICHALSEN

### Pathophysiology, etiology, and prevalence

Throughout history, individuals worldwide have died from diseases that were mostly communicable in nature. Top killers in 1900 included infectious diseases such as pneumonia, tuberculosis, and gastrointestinal infections (Jones, Podolsky, & Greene, 2012). Today, with the advent of antibiotics and improved infection-control measures, deaths from infectious disease in developed countries are rare. At present, five of the top seven causes of mortality are noncommunicable in nature and lifestyle-related including heart disease, cancer, chronic lung disease, stroke, and type 2 diabetes (Jones et al., 2012). These diseases are becoming increasingly more common, with nearly one in two American adults having at least one chronic health condition (Bauer, Briss, Goodman, & Bowman, 2014). Worldwide, chronic, non-communicable diseases were responsible for 68% of deaths in 2012, up nearly 10% from the previous decade (World Health Organization, 2014). Chronic diseases such as diabetes can lead to complications such as heart attacks, blindness, and amputation that are debilitating to the individual and costly to the economy, with one in every five healthcare dollars in the United States spent on diabetes care (American Diabetes Association, 2008).

Chronic lifestyle-related health conditions are attributed primarily to a short list of risk factors, including poor nutrition and physical inactivity (both strongly related to obesity), tobacco use, excessive alcohol consumption, hypertension, and high cholesterol (Bauer et al., 2014). Obesity is a worldwide epidemic that underlies many chronic health conditions, including cardiovascular disease, type 2 diabetes (T2DM), and musculoskeletal disorders. Obesity-related health costs in the United States alone run to nearly \$150 billion per year (Finkelstein, Trogdon, Cohen, & Dietz, 2009).

In the field of public health, there are three ways to manage disease: primary, secondary, and tertiary prevention. Primary prevention consists of measures taken to prevent disease or infirmity, while secondary prevention is the early diagnosis and treatment of conditions to prevent disease progression. Tertiary prevention focuses on treating established diseases to restore function and reduce complications. Treating chronic diseases using tertiary prevention is not only costly but ineffective; for example, only one-third to one-half of individuals with high cholesterol and hypertension are able to maintain adequate control (Hyre, Muntner, Menke, Raggi, & He, 2007). The key to changing the trajectory of the world's health and reducing skyrocketing health care costs lies in primary prevention through changing unhealthy lifestyles. Reducing blood pressure, body weight, blood sugar, and cholesterol by only 1% could save \$83 to \$103 per person annually in medical costs (Henke et al., 2010). Yoga shows promise as a lifestyle intervention for improving many of the risk factors associated with chronic disease. As such, yoga is preventive medicine.

### Scientific rationale for yoga as preventive medicine

In order to understand how yoga is preventive medicine, one must understand the physiology underlying the development of lifestyle-related diseases. According to the theory of allostatic load, lifestyle-related diseases result from dysfunction of the hypothalamic–pituitary–adrenal (HPA) axis and the sympathetic–adrenal–medullary (SAM) system in response to chronic exposure to stress (McEwen & Gianaros, 2010). When an individual experiences a real or perceived threat, whether it is a major life event, a trauma, work-related, family-related, or a societal stressor, a network within the brain that includes the amygdala, the hippocampus, and the

<https://www.handspringpublishing.com/product/principles-practice-yoga-health-care/>

## **Yoga for metabolic syndrome: A systematic review and meta-analysis**

**Holger Cramer<sup>1,2</sup>, Jost Langhorst<sup>1</sup>, Gustav Dobos<sup>1</sup>  
and Romy Lauche<sup>1,2</sup>**

European Journal of Preventive  
Cardiology

2016, Vol. 23(18) 1982–1993

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Cardiology 2016

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DOI: 10.1177/2047487316665729

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“...yoga can be preliminarily considered to be a safe and effective intervention in order to reduce waist circumference and systolic blood pressure. Yoga might be considered as an alternative approach for patients who are not adhering to conventional forms of exercise.”

<https://pubmed.ncbi.nlm.nih.gov/27550905/>



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## Preventive Medicine

journal homepage: [www.elsevier.com/locate/ypmed](http://www.elsevier.com/locate/ypmed)



### Review Article

## A systematic review and meta-analysis on the effects of yoga on weight-related outcomes



Romy Lauche<sup>a,b</sup>, Jost Langhorst<sup>a</sup>, Myeong Soo Lee<sup>c</sup>, Gustav Dobos<sup>a</sup>, Holger Cramer<sup>a,b,\*</sup>

<sup>a</sup> Department of Internal and Integrative Medicine, Kliniken Essen-Mitte, Faculty of Medicine, University of Duisburg-Essen, Essen, Germany

<sup>b</sup> Australian Research Centre in Complementary and Integrative Medicine (ARCCIM), University of Technology Sydney, Sydney, Australia

<sup>c</sup> Medical Research Division, Korea Institute of Oriental Medicine, Daejeon, South Korea

“...yoga can however be preliminarily considered a safe and effective intervention to reduce body mass index in overweight or obese but otherwise healthy adults.”

“...yoga can be specifically considered as an alternative to other forms of physical activity for overweight/obese individuals who are not adherent to recommended physical activity regimens.”

<https://pubmed.ncbi.nlm.nih.gov/27058944/>

RESEARCH ARTICLE

**Citation:** Ramamoorthi R, Gahreman D, Skinner T, Moss S (2019) The effect of yoga practice on glycemic control and other health parameters in the prediabetic state: A systematic review and meta-analysis. PLoS ONE 14(10): e0221067. <https://doi.org/10.1371/journal.pone.0221067>

# The effect of yoga practice on glycemic control and other health parameters in the prediabetic state: A systematic review and meta-analysis

Ramya Ramamoorthi<sup>1\*</sup>, Daniel Gahreman<sup>1</sup>, Timothy Skinner<sup>2</sup>, Simon Moss<sup>1</sup>

**1** College of Health and Human Sciences, Charles Darwin University, Darwin, Northern Territory, Australia, **2** Københavns Universitet, Institut for Psykologi, Center for Sundhed og Samfund, Københavns Universitet, København K, Denmark

\* [Ramya.Ramamoorthi@cdu.edu.au](mailto:Ramya.Ramamoorthi@cdu.edu.au)

“Compared to controls, yoga intervention improved fasting blood glucose (FBG)...; low density lipoprotein (LDL)...; triglycerides...; total cholesterol ...; and systolic blood pressure... This meta-analysis uncovered clinically improved effects of yoga intervention on glycemic control, lipid profiles and other parameters of T2DM management in prediabetic population. These results suggest that yoga intervention may be considered as a comprehensive and alternative approach to preventing T2DM.”

<https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0221067&type=printable>

# Yoga Practitioners and Health Behavior

TABLE 2: Summary of results of final linear and logistic regression models predicting health outcomes from general patterns of yoga practice in combination with influential demographic predictors ( $N = 1045$ ).

Health outcome	Final predictors <sup>a</sup>	Parameter statistics		
		<i>B</i>	SE	<i>t</i>
Mindfulness	Practice frequency <sup>b</sup>	.106	.014	7.53**
	Years of practice	.039	.018	2.17*
Subjective well-being	Practice frequency <sup>b</sup>	.183	.034	5.31**
	Gender <sup>c</sup>	3.39	.915	3.72**
BMI ( $n = 1034$ )	Practice frequency <sup>b</sup>	-.043	.012	-3.26**
	Gender <sup>c</sup>	-2.013	.321	-6.28**
Fruit and vegetables/Day ( $n = 1043$ )	Practice frequency <sup>b</sup>	.031	.006	5.59**
	Age	.013	.005	2.92**
	Gender <sup>c</sup>	-.583	.147	-3.97**
Sleep disturbance	Practice frequency <sup>b</sup>	-.052	.009	-5.58**
	Practice frequency <sup>b</sup>	-.171	.042	-4.02**
Fatigue	Age	-.072	.011	-6.36**
	Practice frequency <sup>b</sup> x Age	.002	.001	2.91**
				Wald/OR
Vegetarian status	Practice frequency <sup>b</sup>	.056	.011	25.78*/1.057*

From: *Frequency of yoga practice predicts health: results of a national survey of yoga practitioners*, Ross A, Friedmann E, Bevans M, Thomas S, *Evidence Based Complementary and Alternative Medicine*, 983258, 2012.

<http://downloads.hindawi.com/journals/ecam/2012/983258.pdf>



# Reasons for Practice

TABLE 2. PRIMARY AND ADDITIONAL REASONS FOR ADOPTING AND MAINTAINING YOGA PRACTICE IN N (%)

	<i>Original reason for starting yoga</i>		<i>Current reason for practicing yoga</i>	
	<i>Primary reason</i>	<i>Additional reasons<sup>a</sup></i>	<i>Primary reason</i>	<i>Additional reasons<sup>a</sup></i>
Prevention/health promotion	434 (25.5%)	716 (42.1%)	654 (38.4%)	733 (43.1%)
Treating a health issue	285 (16.7%)	497 (29.2%)	107 (6.3%)	504 (29.6%)
Spirituality	198 (11.6%)	463 (27.2%)	450 (26.4%)	581 (34.1%)
Physician's or therapist's advice	29 (1.7%)	65 (3.8%)	2 (0.1%)	12 (0.7%)
Relaxation	453 (26.6%)	713 (41.9%)	309 (18.2%)	801 (47.1%)
Get fit/get into shape	40 (2.4%)	235 (13.8%)	25 (1.5%)	268 (15.7%)
Current popularity	3 (0.2%)	9 (0.5%)	1 (0.1%)	4 (0.2%)
Looking for a hobby	14 (0.8%)	58 (3.4%)	1 (0.1%)	24 (1.4%)
Socializing	2 (0.1%)	71 (4.2%)	2 (0.1%)	116 (6.8%)
Monetary incentive from health insurance	2 (0.1%)	21 (1.2%)	0 (0.0%)	16 (0.9%)
Advice from friends or family	106 (6.2%)	158 (9.3%)	4 (0.2%)	10 (0.6%)
Other reasons	136 (8.0%)	120 (7.1%)	147 (8.6%)	148 (8.7%)

<sup>a</sup>More than one additional reason per participant possible.

From: *Motivations for Adopting and Maintaining a Yoga Practice: A National Cross-Sectional Survey*. Park CL, Quinker D, Dobos G, Cramer H, *Journal of Alternative and Complementary Medicine*, 25:1009-1014, 2019.

<https://pubmed.ncbi.nlm.nih.gov/31460773/>

# Yoga Practitioners and Health Behavior and Perceptions of Yoga on Health

**Table 1**

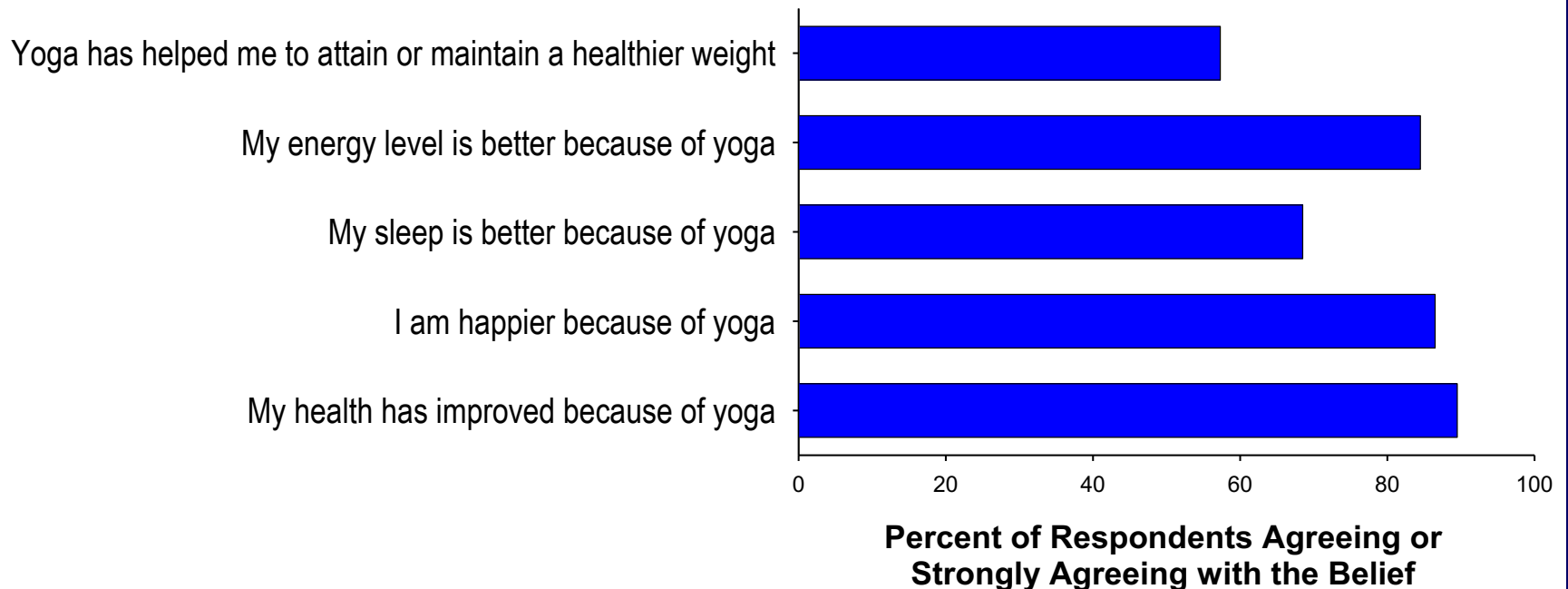
Sociodemographic, health and health behavior characteristics of participants.

	n (%)
Change in health since starting yoga	
Much better now	971 (57.1%)
Somewhat better now	520 (30.6%)
About the same	159 (9.3%)
Somewhat worse now	46 (2.7%)
Much worse now	6 (0.4%)

From: *Associations of yoga practice, health status, and health behavior among yoga practitioners in Germany-Results of a national cross-sectional survey*. Cramer H, Quinker D, Pilkington K, Mason H, Adams J, Dobos G, *Complementary Therapies in Medicine* 42:19-26, 2019. <https://pubmed.ncbi.nlm.nih.gov/30670242/>

# Perceptions of Yoga on Health

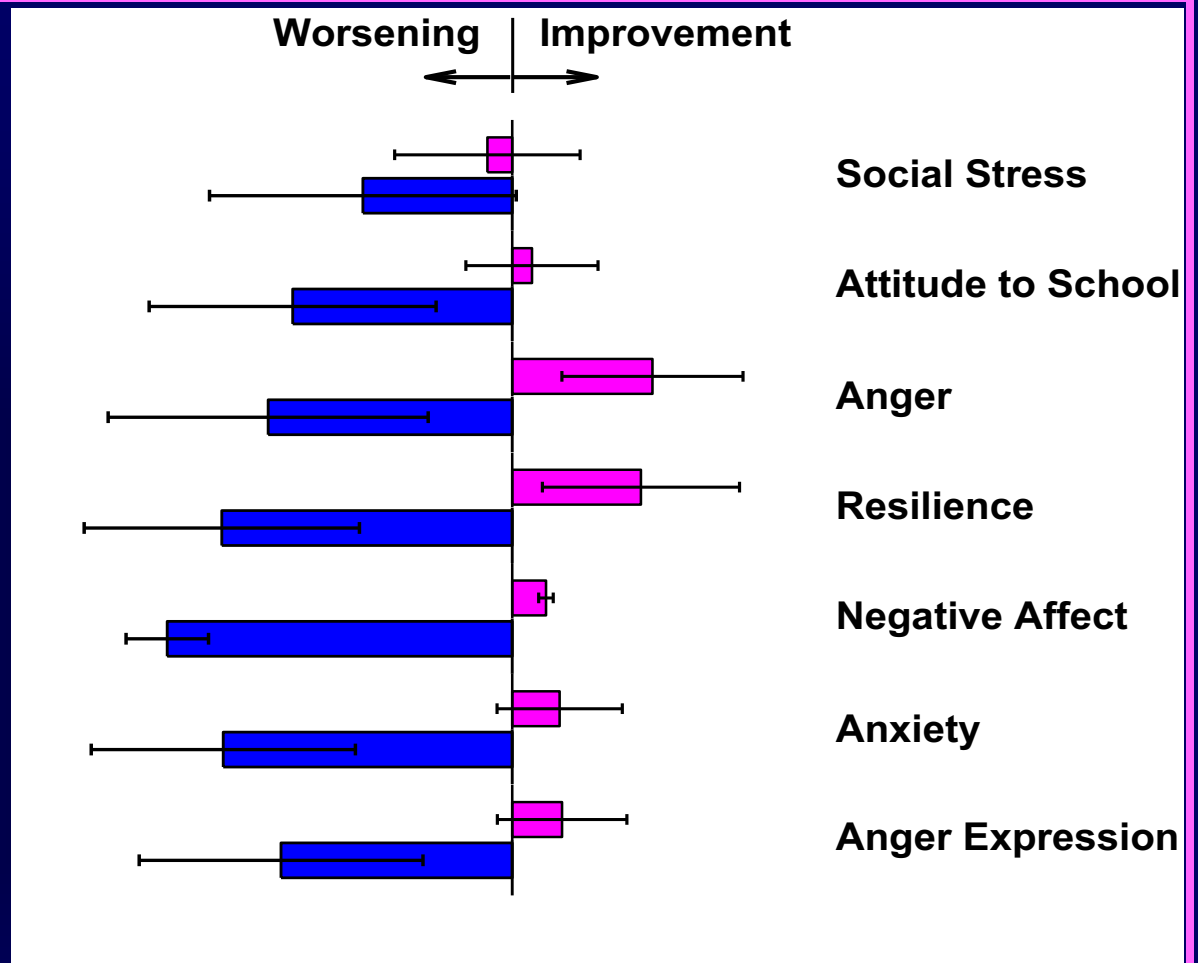
## Belief about Yoga and Health



From: *National survey of yoga practitioners: mental and physical health benefits*, Ross A, Friedmann E, Bevans M, Thomas S, *Complementary Therapies Medicine*, 21:313-23, 2013.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3721070/pdf/nihms475569.pdf>

# Yoga in High School



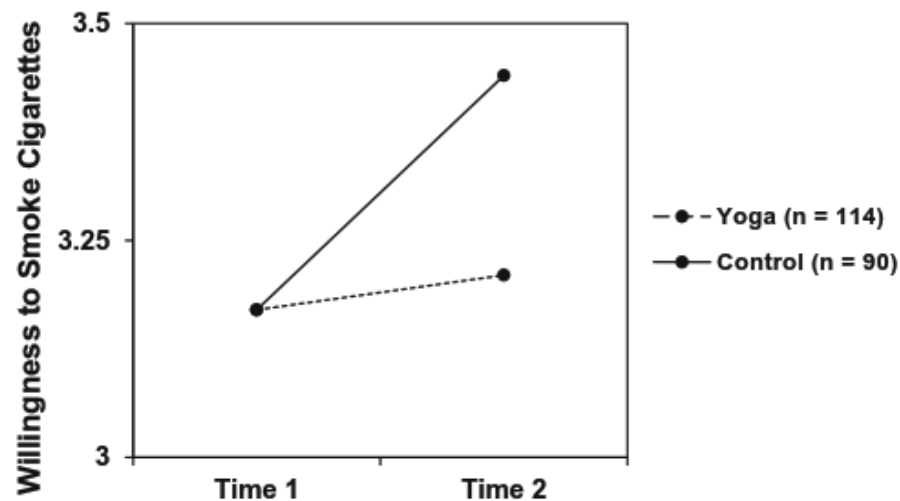
From: *Evaluation of the mental health benefits of yoga in a secondary school: a preliminary randomized controlled trial.* Khalsa SB, Hickey-Schultz L, Cohen D, Steiner N, Cope S, *Journal of Behavioral Health Services Research*, 39:80-90, 2012;  
<https://pubmed.ncbi.nlm.nih.gov/21647811/>

*Benefits of yoga for psychosocial well-being in a US high school curriculum: a preliminary randomized controlled trial.* Noggle JJ, Steiner NJ, Minami T, Khalsa SB, *Journal of Developmental and Behavioral Pediatrics*, 33:193-201, 2012.  
<https://pubmed.ncbi.nlm.nih.gov/22343481/>

EMPIRICAL RESEARCH

## Evaluation of Yoga for Preventing Adolescent Substance Use Risk Factors in a Middle School Setting: A Preliminary Group-Randomized Controlled Trial

Bethany Butzer<sup>1</sup> · Amanda LoRusso<sup>2</sup> · Sunny H. Shin<sup>3</sup> · Sat Bir S. Khalsa<sup>2</sup>



**Fig. 3** Yoga and control group participants' willingness to smoke cigarettes at baseline (time 1) and end-program (time 2). ANCOVA on end-program scores (with baseline scores as a covariate) significant at  $p < 0.05$



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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.

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