Complementary and Alternative Medicine (CAM): its benefits for EU citizens with musculoskeletal disorders

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Effectiveness research: Yoga

Dr. Holger Cramer

Kliniken Essen-Mitte, University of Duisburg-Essen, Germany

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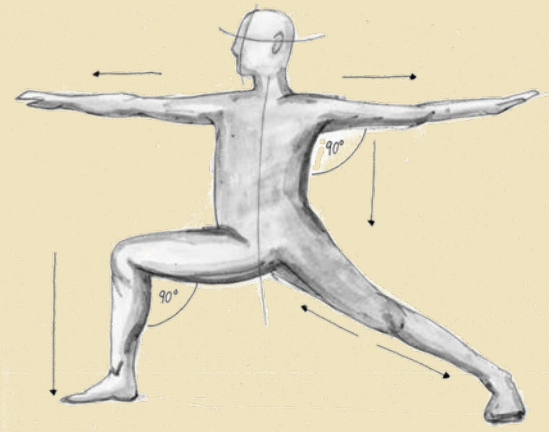
Eight limbs of Yoga

1. ‘Yama’ (ethical rules)
2. ‘Niyama’ (ethical lifestyle)
3. ‘Asana’ (physical postures)
4. ‘Pranayama’ (breath control)
5. ‘Pratyahara’ (withdrawal of the senses)
6. ‘Dharana’ (concentration)
7. ‘Dhyana’ (meditation)
8. ‘Samadhi’ (oneness with the object of meditation)



Yoga Therapy

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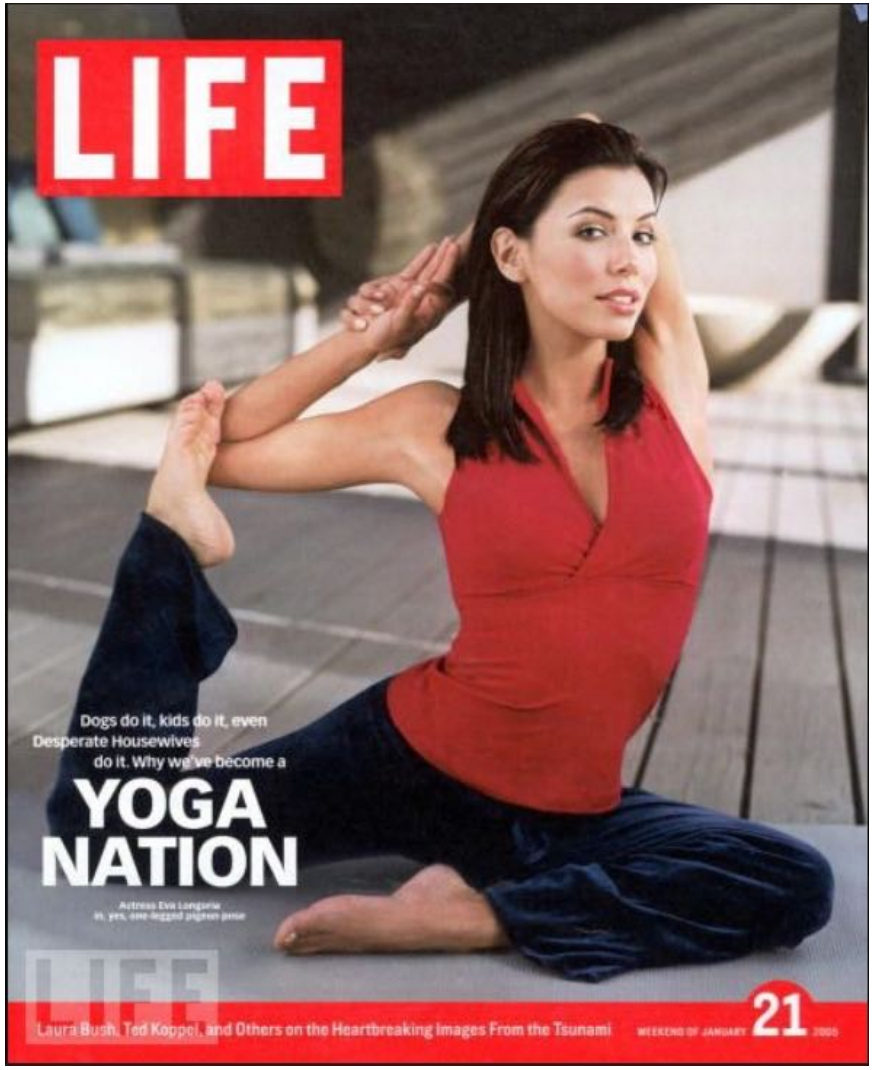
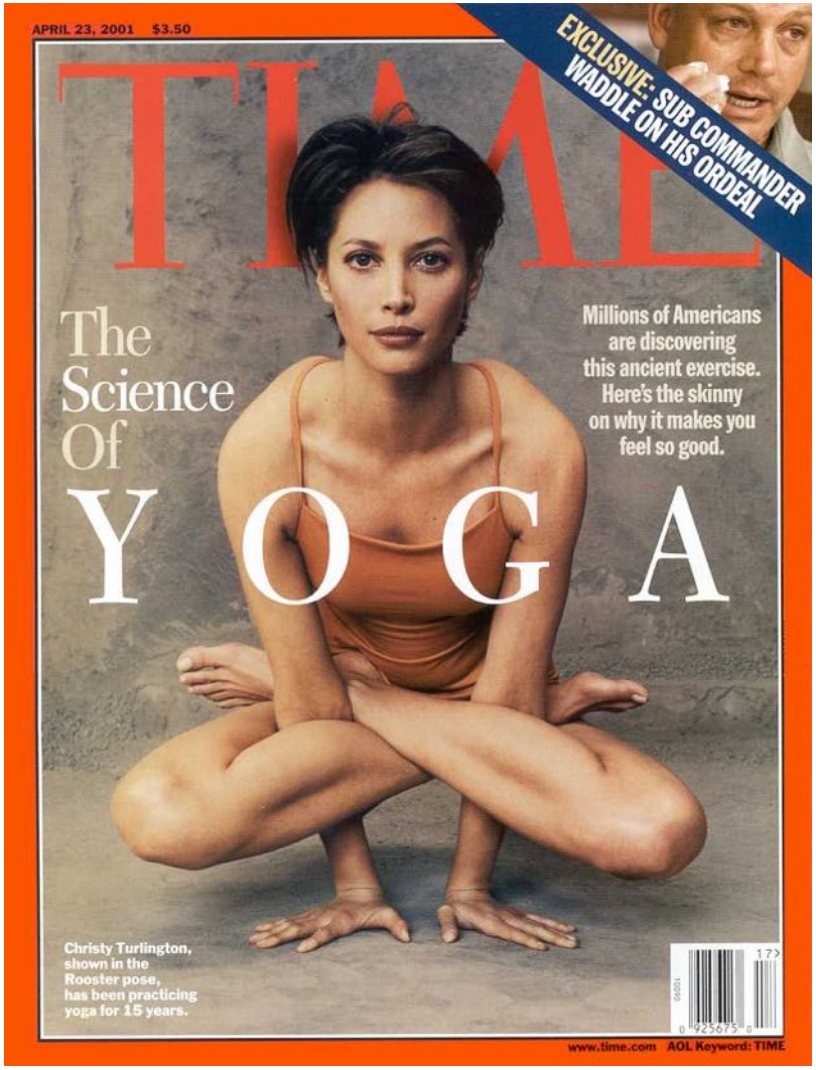
"Yoga therapy refers to the adaptation and application of Yoga techniques and practices to help individuals facing health challenges at any level manage their condition, reduce symptoms, restore balance, increase vitality, and improve attitude."

Gary Kraftsow, American Viniyoga Institute

Yoga: Does it matter?





Yoga: Does it matter?

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Yoga: Does it matter?

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June 21, save the date!

Prevalence of Yoga Use

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USA

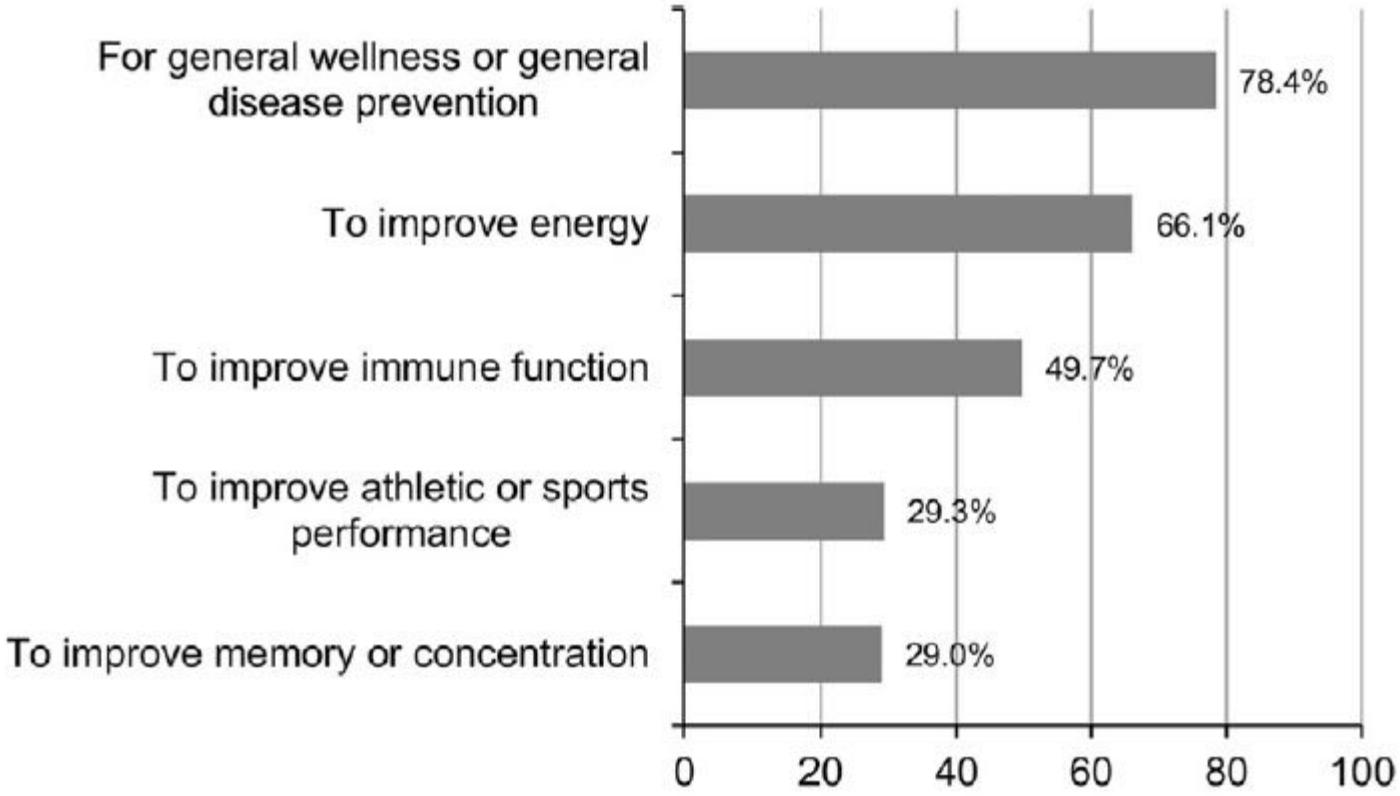
- Lifetime prevalence 13.2%
- About 31 million US adults

Germany

- Lifetime prevalence 15.1%
- About 12 million German adults

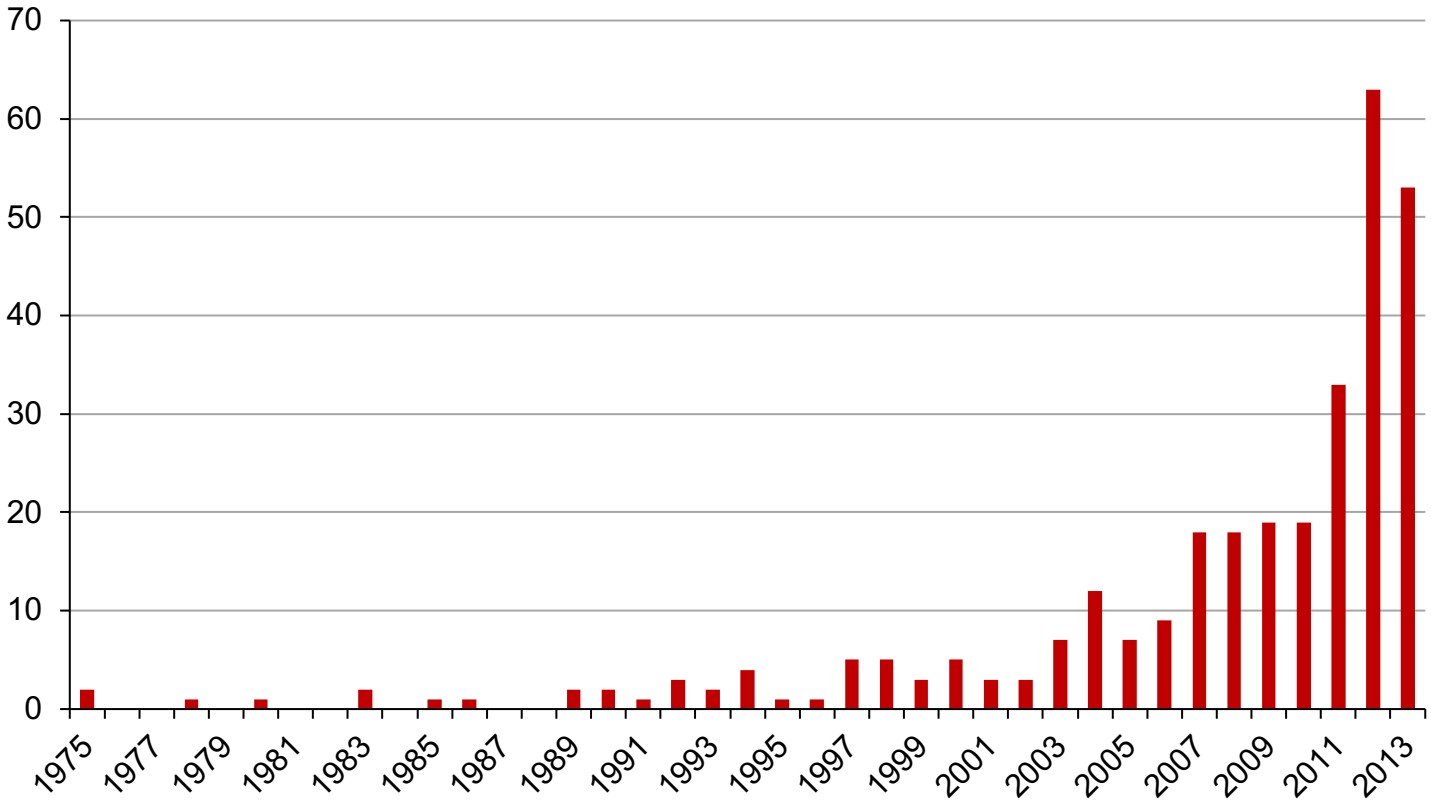
Cramer et al. Am J Prev Med. 2015.
Cramer. Forsch Komplementmed. 2015.

Prevalence of Yoga Use



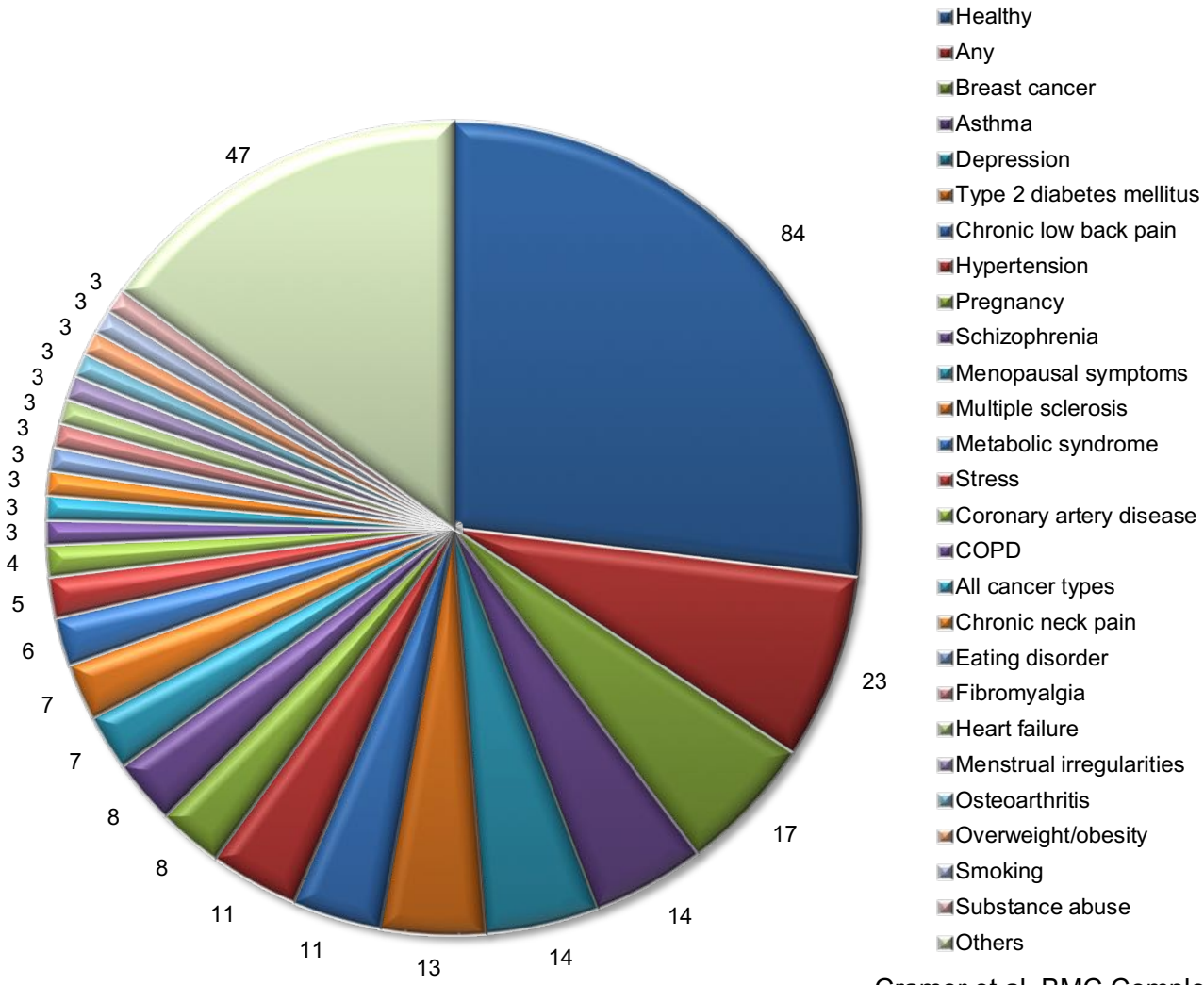
Cramer et al. Am J Prev Med. 2015.

Yoga Therapy: the Research Evidence



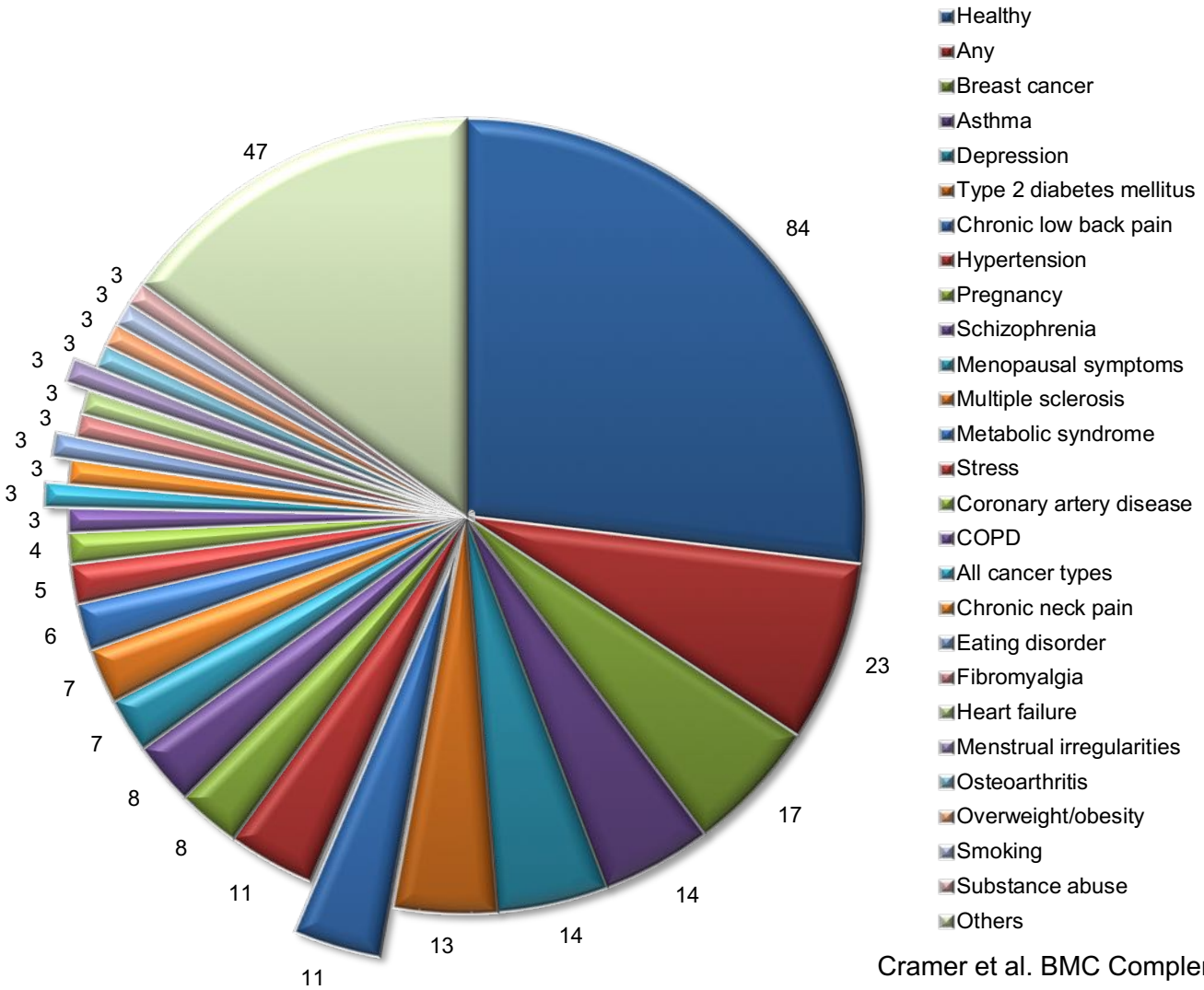
Cramer et al. BMC Complement Altern Med, 2014.

Yoga Therapy: the Research Evidence



Cramer et al. BMC Complement Altern Med, 2014.

Yoga Therapy: the Research Evidence



Cramer et al. BMC Complement Altern Med, 2014.

Yoga for Chronic Low Back Pain

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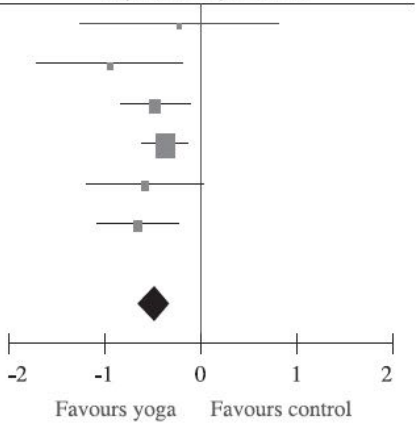
A Short-term effects

Pain

Study	Yoga Mean	Yoga SD	Yoga Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Cox et al., 2010[a]	-7.72	11.15	6	-5.16	10.45	9	2.6%	-0.22 [-1.26, 0.81]
Saper et al., 2009	-2.3	2.1	15	-0.4	1.8	15	4.8%	-0.95 [-1.71, -0.18]
Sherman et al., 2011	3.26	1.98	92	4.2	1.96	45	21.5%	-0.47 [-0.83, -0.11]
Tilbrook et al., 2011[a]	20.83	11.26	130	25.24	12.23	138	48.0%	-0.37 [-0.62, -0.13]
Williams et al., 2005	1	1.1	20	2.1	2.3	24	7.6%	-0.58 [-1.19, 0.02]
Williams et al., 2009	24.3	17.9	43	36.9	19.81	47	15.5%	-0.66 [-1.09, -0.23]
Total (95% CI)			**306**			**278**	**100.0%**	**-0.48 [-0.65, -0.31]**

Heterogeneity: $Chi^2 = 3.21$, df = 5 (P = 0.67); $I^2 = 0\%$

Test for overall effect: Z = 5.61 (P < 0.00001)

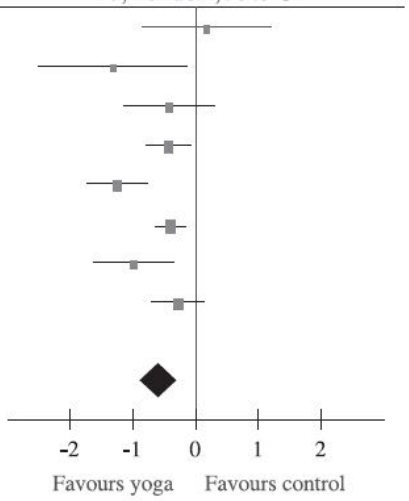


Back-specific disability

Study	Yoga Mean	Yoga SD	Yoga Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Cox et al., 2010[a]	-1.76	8.49	6	-2.94	4.33	9	5.7%	0.18 [-0.86, 1.21]
Galantino et al., 2004	21.15	10.18	11	38.91	17.56	5	4.6%	-1.32 [-2.50, -0.14]
Saper et al., 2009	-6.3	6.9	15	-3.7	4.9	15	9.4%	-0.42 [-1.15, 0.30]
Sherman et al., 2011	4.59	4.49	92	6.56	4.63	45	17.6%	-0.43 [-0.79, -0.07]
Tekur et al., 2008, 2010	18.7	11.55	40	35.75	15.19	40	14.4%	-1.25 [-1.73, -0.77]
Tilbrook et al., 2011[a]	5.15	4.88	136	7.24	5.45	141	21.0%	-0.40 [-0.64, -0.16]
Williams et al., 2005	3.3	5.1	20	12.8	11.9	24	11.1%	-0.99 [-1.62, -0.36]
Williams et al., 2009	17.9	10.49	43	20.8	10.28	47	16.1%	-0.28 [-0.69, 0.14]
Total (95% CI)			**363**			**326**	**100.0%**	**-0.59 [-0.87, -0.30]**

Heterogeneity: $Chi^2 = 17.02$, df = 7 (P = 0.02); $I^2 = 59\%$

Test for overall effect: Z = 4.06 (P < 0.0001)



Yoga for Chronic Low Back Pain

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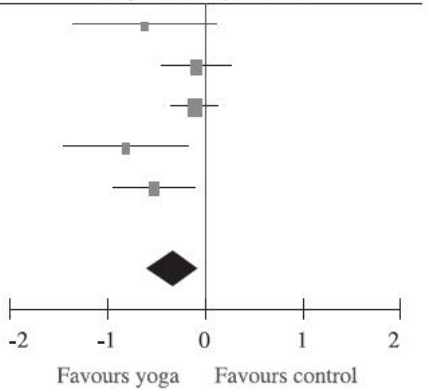
B Long-term effects

Pain

Study	Yoga Mean	Yoga SD	Yoga Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Saper et al., 2009[a]	3.9	0.6	15	4.5	1.2	15	9.9%	-0.62 [-1.35, 0.12]
Sherman et al., 2011	3.59	2.27	92	3.8	2.2	45	24.5%	-0.09 [-0.45, 0.26]
Tilbrook et al., 2011[a]	21.75	13.89	127	23.16	12.28	138	32.4%	-0.11 [-0.35, 0.13]
Williams et al., 2005	0.6	1.1	20	2	2.1	22	12.4%	-0.81 [-1.44, -0.18]
Williams et al., 2009	27.7	22.56	43	38.5	18.3	47	20.8%	-0.52 [-0.94, -0.10]
Total (95% CI)			**297**			**267**	**100.0%**	**-0.33 [-0.59, -0.07]**

Heterogeneity: $Chi^2 = 7.65$, df = 4 (P = 0.11); $I^2 = 48\%$

Test for overall effect: Z = 2.45 (P = 0.01)

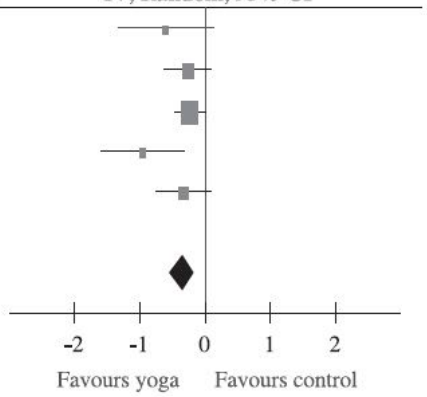


Back-specific disability

Study	Yoga Mean	Yoga SD	Yoga Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Saper et al., 2009	6.6	2.6	15	8.3	2.9	15	7.0%	-0.60 [-1.33, 0.13]
Sherman et al., 2011	4.49	4.73	92	5.73	4.66	45	23.9%	-0.26 [-0.62, 0.10]
Tilbrook et al., 2011[a]	5.22	5.27	135	6.43	5.23	140	41.4%	-0.23 [-0.47, 0.01]
Williams et al., 2005	3.9	5.3	20	12.7	11.4	22	8.9%	-0.96 [-1.60, -0.31]
Williams et al., 2009	19.3	12.72	43	23.5	12.34	47	18.8%	-0.33 [-0.75, 0.08]
Total (95% CI)			**305**			**269**	**100.0%**	**-0.35 [-0.55, -0.15]**

Heterogeneity: $Chi^2 = 4.98$, df = 4 (P = 0.29); $I^2 = 20\%$

Test for overall effect: Z = 3.39 (P = 0.0007)



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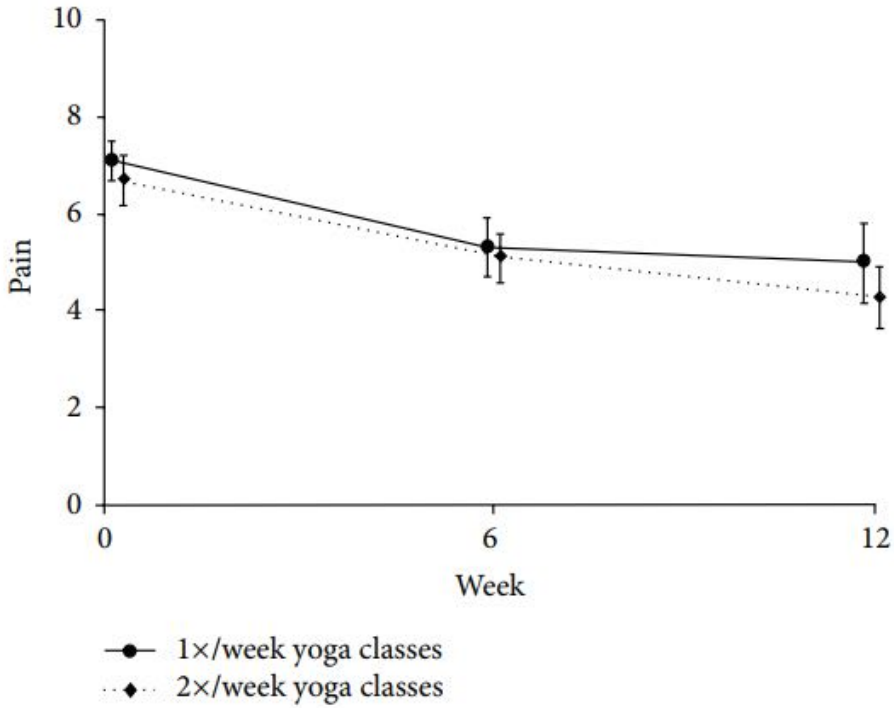

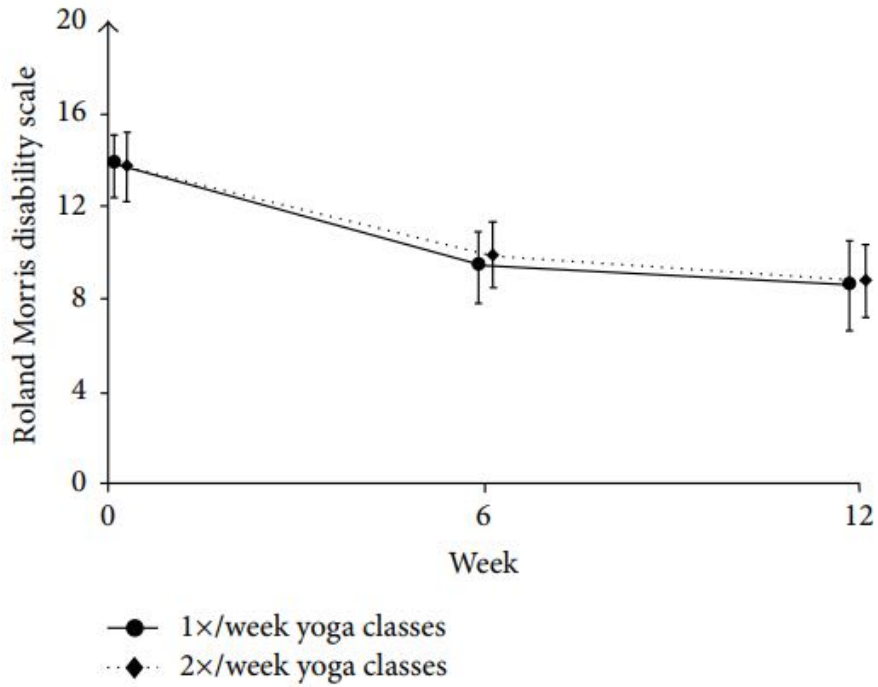

Saper et al. eCAM, 2013.

Yoga for Chronic Neck Pain

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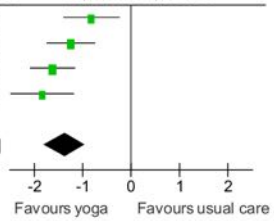
Neck pain intensity

Study	Yoga Mean	Yoga SD	Yoga Total	Usual care Mean	Usual care SD	Usual care Total	Weight	Std. Mean Difference IV, Random, 95% CI
Cramer et al., 2013	20.7	13.6	25	37.2	24.4	26	23.5%	-0.82 [-1.39, -0.24]
Michalsen et al., 2012	13.0	11.6	38	34.4	21.1	39	27.0%	-1.24 [-1.73, -0.75]
Satyanand et al., 2015	0.4	0.6	50	2.1	1.4	50	28.6%	-1.61 [-2.07, -1.16]
Yogitha et al., 2010	3.7	6.7	28	30.7	19.8	26	21.0%	-1.83 [-2.47, -1.19]
Total (95% CI)			**141**			**141**	**100.0%**	**-1.37 [-1.78, -0.97]**

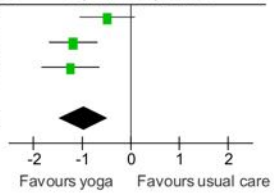
Heterogeneity: Chi² = 6.90, df = 3 (P = 0.08); I² = 57%
Test for overall effect: Z = 6.64 (P < 0.00001)



Neck pain-related disability

Study	Yoga Mean	Yoga SD	Yoga Total	Usual care Mean	Usual care SD	Usual care Total	Weight	Std. Mean Difference IV, Random, 95% CI
Cramer et al., 2013	20.0	9.8	25	26.2	15.0	26	32.5%	-0.48 [-1.04, 0.08]
Michalsen et al., 2012	18.4	4.0	38	24.5	6.0	39	36.5%	-1.18 [-1.67, -0.70]
Yogitha et al., 2010	3.9	5.4	28	13.9	10.0	26	31.0%	-1.24 [-1.82, -0.65]
Total (95% CI)			**91**			**91**	**100.0%**	**-0.97 [-1.44, -0.50]**

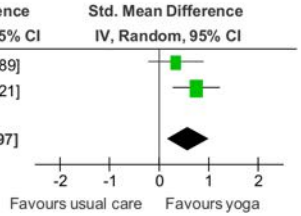
Heterogeneity: Chi² = 4.48, df = 2 (P = 0.11); I² = 55%
Test for overall effect: Z = 4.06 (P < 0.0001)



Quality of life

Study	Yoga Mean	Yoga SD	Yoga Total	Usual care Mean	Usual care SD	Usual care Total	Weight	Std. Mean Difference IV, Random, 95% CI
Cramer et al., 2013	47.3	7.3	25	44.2	10.4	26	43.0%	0.34 [-0.21, 0.89]
Michalsen et al., 2012	46.5	7.3	38	41.3	6.4	39	57.0%	0.75 [0.29, 1.21]
Total (95% CI)			**63**			**65**	**100.0%**	**0.57 [0.17, 0.97]**

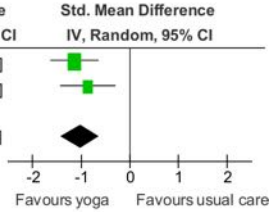
Heterogeneity: Chi² = 1.25, df = 1 (P = 0.26); I² = 20%
Test for overall effect: Z = 2.81 (P = 0.005)



Mood

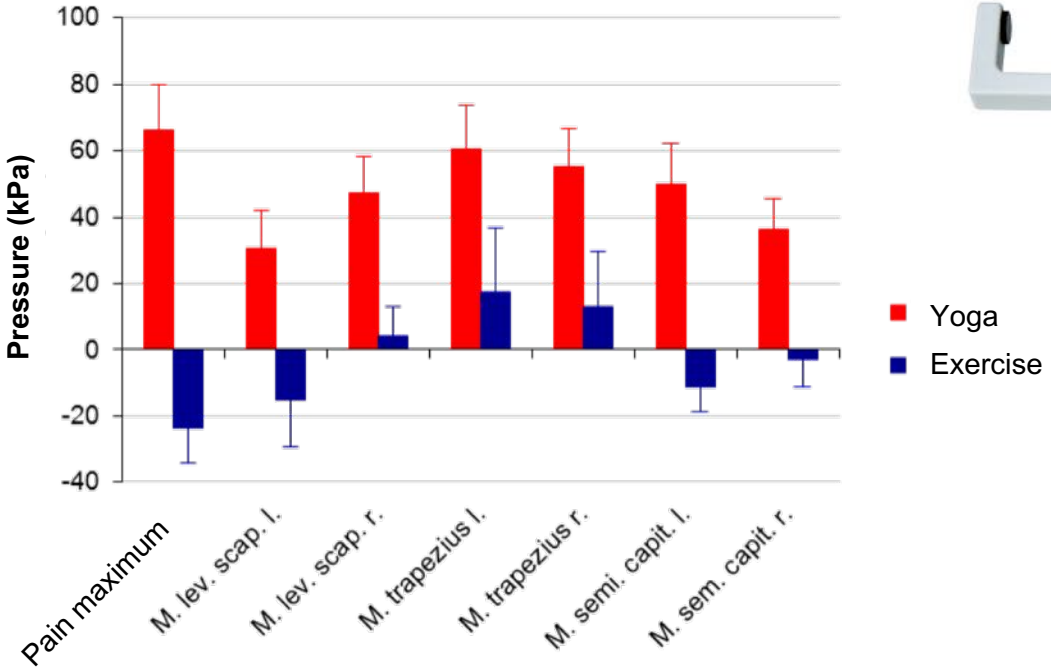
Study	Yoga Mean	Yoga SD	Yoga Total	Usual care Mean	Usual care SD	Usual care Total	Weight	Std. Mean Difference IV, Random, 95% CI
Michalsen et al., 2012	8.4	5.6	38	18.0	10.4	39	57.3%	-1.13 [-1.62, -0.65]
Yogitha et al., 2010	45.8	10.7	28	53.4	5.6	26	42.7%	-0.86 [-1.42, -0.30]
Total (95% CI)			**66**			**65**	**100.0%**	**-1.02 [-1.38, -0.65]**

Heterogeneity: Chi² = 0.52, df = 1 (P = 0.47); I² = 0%
Test for overall effect: Z = 5.45 (P < 0.00001)



Cramer et al. Disabil Rehab. 2017.

Yoga for Chronic Neck Pain



Cramer et al. Clin J Pain, 2013.

Yoga for Chronic Neck Pain

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Follow-up 12 months after the end of the intervention

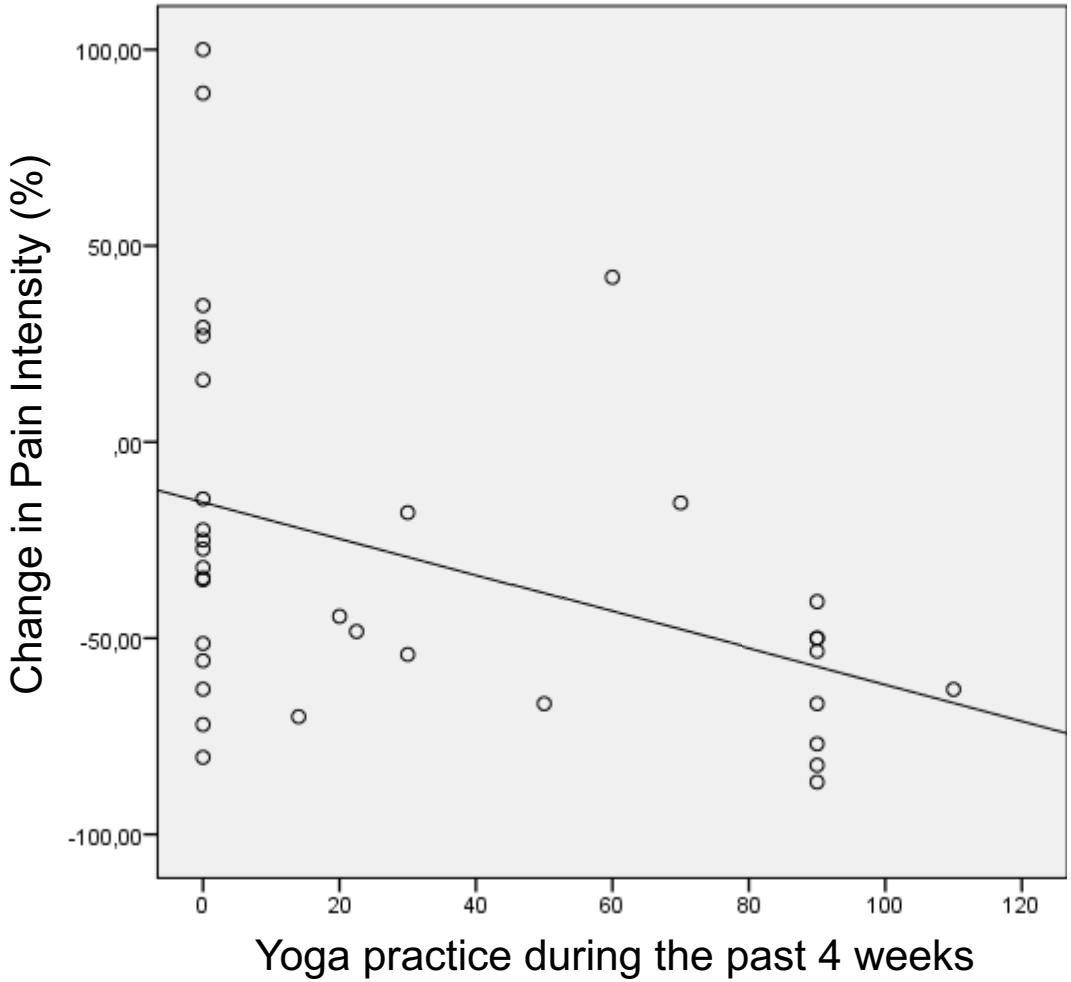
Table 2 Effects (mean ± standard deviation) of yoga from baseline to 12-month follow-up

Outcome	Baseline	12-Month Follow-Up	Change	Effect Size	*P*
Pain intensity	48.81 ± 17.71	32.31 ± 20.68	−16.50 (−23.73 to −9.27)	−0.93 (−1.34 to −0.52)	<0.001
Neck-related disability	25.26 ± 9.02	19.49 ± 11.52	−5.77 (−9.15 to −2.39)	−0.64 (−1.01 to −0.26)	0.001

- About $^{2}/_{3}$ of patients obtained a reduction of at least 30% in their neck pain

Cramer et al. Pain Med, 2013.

Yoga for Chronic Neck Pain



Cramer et al. Pain Med, 2013.

Yoga for Rheumatic Diseases

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Table 4

Study Findings

Authors	Study Quality	Clinical Outcomes	Functional Outcomes	Psychosocial Outcomes
Kolasinski et al	4	Improved: WOMAC pain, function Trend: GA No change: Stiffness	No change: 50 ft. walk	Improved: Affect
Garfinkel et al	6	Improved: finger tenderness, hand pain, ROM No change: hand function, ring size	No change: grip strength	
Haslock et al	6	Trend: HAQ-DI, ring size	Improved: Grip strength	No change: GHQ
Dash and Telles	4		Improved: Grip strength	
Sharma	3			Improved: Self efficacy for yoga
Badsha et al	6	Improved: HAQ-DI, DAS-28 No change: HAQ Pain		No change: physical/mental QOL
Haaz	5	Improved: tender/swollen joints		Improved: physical & emotional roles, energy (RA), pain (RA) Trend: Mental health, energy (OA), pain (OA)
Bosch	4	Improved: HAQ-DI and Pain	Improved: Balance	Improved: Depressive symptoms, daytime cortisol Trend: diurnal, awakening cortisol
Evans	2	Improved: pain (PDI, HAQ) Trend: physical functioning No change: HAQ-DI		Improved: vitality, mental health, global severity, self-efficacy Trend: chronic pain acceptance, mindfulness

Haaz & Bartlett. Rheum Dis Clin North Am. 2012.

Yoga for Rheumatic Diseases

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Physical health, fitness, psychological function, and HRQL by group at baseline and week 8 of RCT.

	Yoga (N=25)^			Waitlist (N=28)∞			Week 8 Difference (95% CI)		
Variable (mean SD)	**Week 0**	**Week 8**	**p-value†**	**Week 0**	**Week 8**	**p-value†**	**Unadjusted**	**Model 1≠**	**Model 2†**
SF-36 Physical Component	36.3 ± 10.4	43.4 ± 9.0	.002	33.9 ± 10.5	35.3 ± 11.0	.345	**8.1 (2.5, 13.7)**	**6.5 (2.0, 10.7)**	**6.5 (1.9, 11.0)**
Fitness									
Sit and Reach (cm)	−2.8 ± 5.2	0.1 ± 5.1	.000	−5.6 ± 6.2	−4.2 ± 6.2	.260	**4.5 (1.0, 8.1)**	2.7 (−0.1, 5.5)	**3.0 (0.2, 5.9)**
One Leg Stance* (s)	25.6 ± 9.5	26.4 ± 9.1	.464	19.8 ± 10.2	20.5 ± 10.6	.656	5.8 (−0.5, 12.2)	2.0 (−2.4, 6.4)	1.9 (−2.6, 6.4)
Grip strength (kg)	25.5 ± 8.0	25.8 ± 8.2	.815	24.3 ± 9.4	24.5 ± 10.1	.643	1.2 (−4.7, 7.1)	−0.1 (−2.5, 2.3)	−0.2 (−2.7, 2.4)
6-min walk (m)	1450 ± 248	1588 ± 243	.000	1508 ± 337	1494 ± 302	.782	94 (−58, 247)	**125 (15, 235)**	101 (−14, 217)

Moonaz et al. J Rheumatol. 2015.

Yoga for Rheumatic Diseases

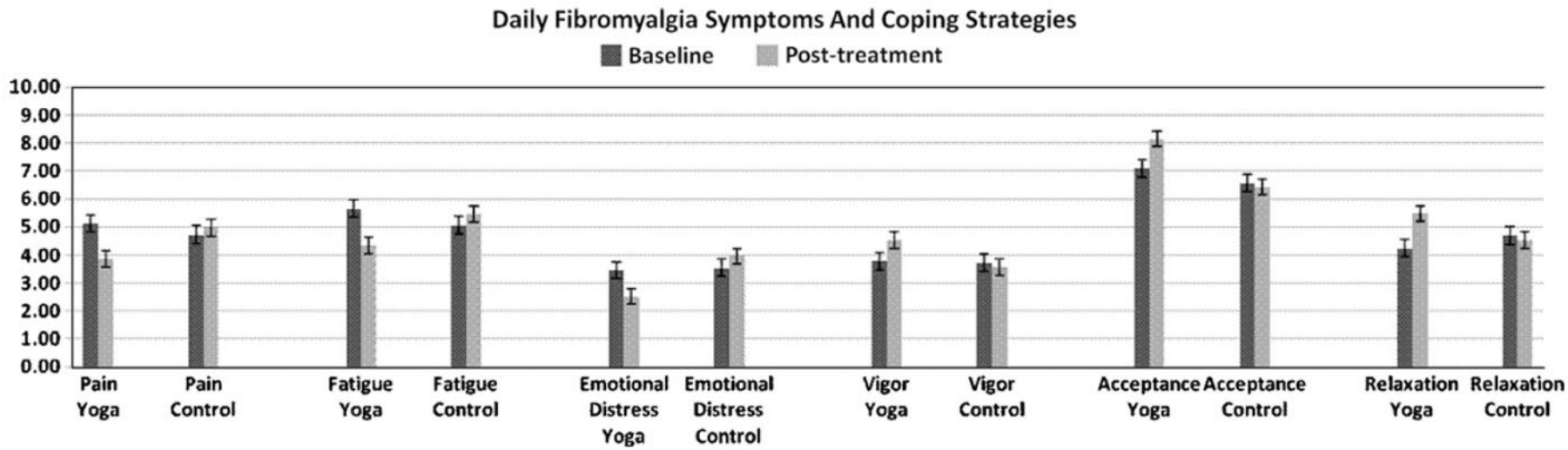

Fig. 2. Daily fibromyalgia symptoms and coping strategies scores (0–10 scales) at baseline and post-treatment in the yoga and control conditions (all $p < .001$). Values are multilevel random effects for adjusted means, with error bars showing standard errors.

Carson et al. Pain. 2010.

But… can Yoga kill you?

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William J. Broad

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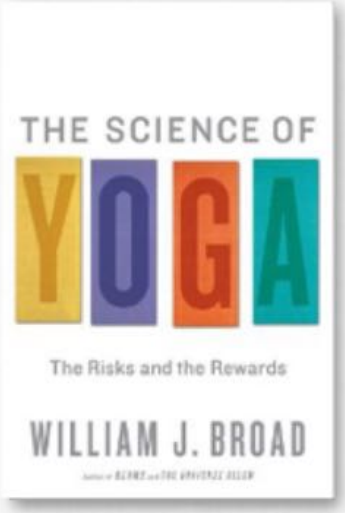


The Science of Yoga. **The Risks and the Rewards.**

synopsis

Five years in the making, *The Science of Yoga* shatters myths, reveals dangers, and lays out surprising benefits. It exposes moves that can maim and kill. It illuminates how yoga can lift moods and inspire creativity. Like science, it bares mysteries. The book presents a fascinating body of evidence suggesting that humans may have latent capabilities for entering states of suspended animation and unremitting sexual bliss.

Buy at Amazon | BARNES & NOBLE | BAM! | iBookstore

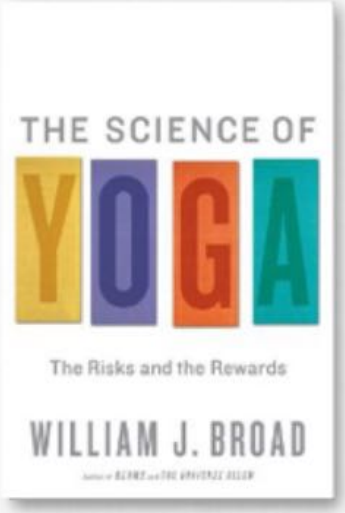
Healing through Controversy Adapted from the Afterword to The Science of Yoga paperback

When published, The Science of Yoga stirred more controversy than anything else I've written as a science journalist. Before it came out, Bobby Clennell, my talented illustrator and a senior Iyengar teacher with a global following, told me the book would start a conversation. The actuality was more like a riot.

- Read more -

But… can Yoga kill you?

William J. Broad



FROM THE MAGAZINE

How Yoga Can Wreck Your Body

Danielle Levitt for The New York Times

Members of the Broadway cast of "Godspell" do their flexible best. From left: Uzo Aduba (doing the wheel), George Salazar (extended-hand-to-big-toe pose) and Nick Blaemire (headstand).

By WILLIAM J. BROAD
Published: January 5, 2012 | 734 Comments

On a cold Saturday in early 2009, Glenn Black, a yoga teacher of nearly four decades, whose devoted clientele includes a number of celebrities and prominent gurus, was giving a master class at Sankalpah Yoga in Manhattan. Black is, in many ways, a classic yogi: he studied in Pune, India, at the institute founded by the legendary B.

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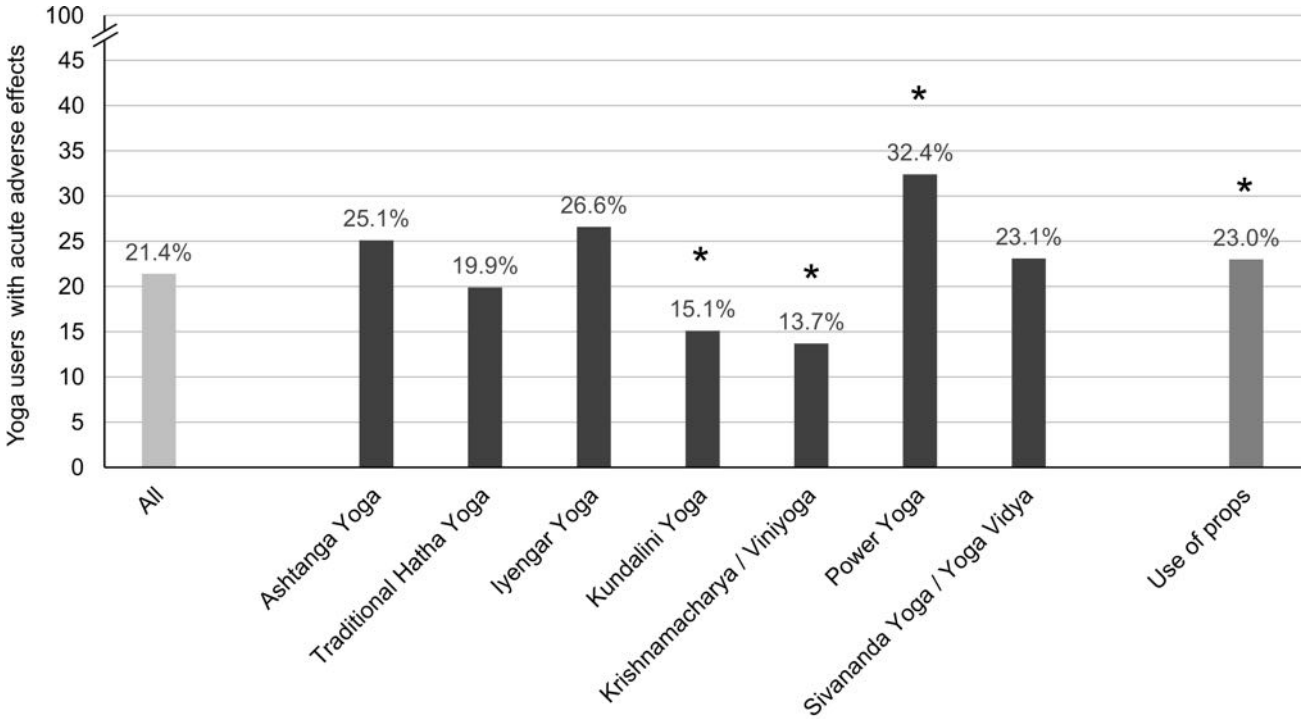
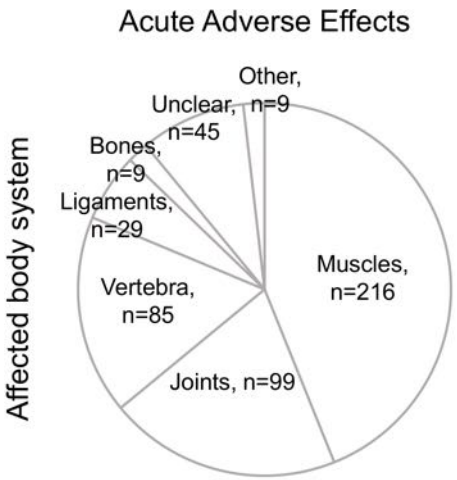
Adverse Events associated with Yoga





Cramer et al. Sports Med. Submitted.

Adverse Events associated with Yoga

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Table 1. Adverse Events of Yoga Versus Exercise and Psychological or Educational Interventions, 1975–2014

Type of Adverse Event	No. of Studies	Yoga		Control		Odds Ratio	95% CI	*P* Value	Heterogeneity		
		No. of Events	No. of Participants	No. of Events	No. of Participants				I^2 Statistic, %	χ^2 Test	*P* Value
Yoga Versus Exercise											
Intervention related	11	16	420	15	404	1.02	0.52, 1.99	0.95	0	0.51	1.00
Nonserious	6	27	284	24	255	1.12	0.60, 2.09	0.71	0	0.36	1.00
Serious	8	2	353	0	324	0.87	0.50, 1.52	0.64	0	9.85	0.77
Dropouts due to adverse event	15	25	867	45	1,049	0.87	0.50, 1.52	0.64	0	9.85	0.77

Cramer et al. Am J Epidemiol. 2015.

Adverse Events associated with Yoga

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TIME

HEALTH EXERCISE/FITNESS

Yoga Is Just As Safe As Other Exercise, Study Finds

Mandy Oaklander @mandyoaklander | Aug. 11, 2015

A large new study chips away at the myth that yoga is dangerous

Elizabeth Renstrom for TIME

If you've ever searched for an excuse not to do yoga, you likely have one article at the ready: "How Yoga Can Wreck Your Body," published by the *New York Times* in 2012. After reading descriptions of injuries like torn Achilles tendons, degenerated hip sockets and sudden stroke, you'd be inclined to think swearing off yoga was the healthier choice.

But is it? Dr. Holger Cramer, director of yoga research at the University of Duisburg-Essen in Germany,

Yoga for Musculoskeletal Disorders

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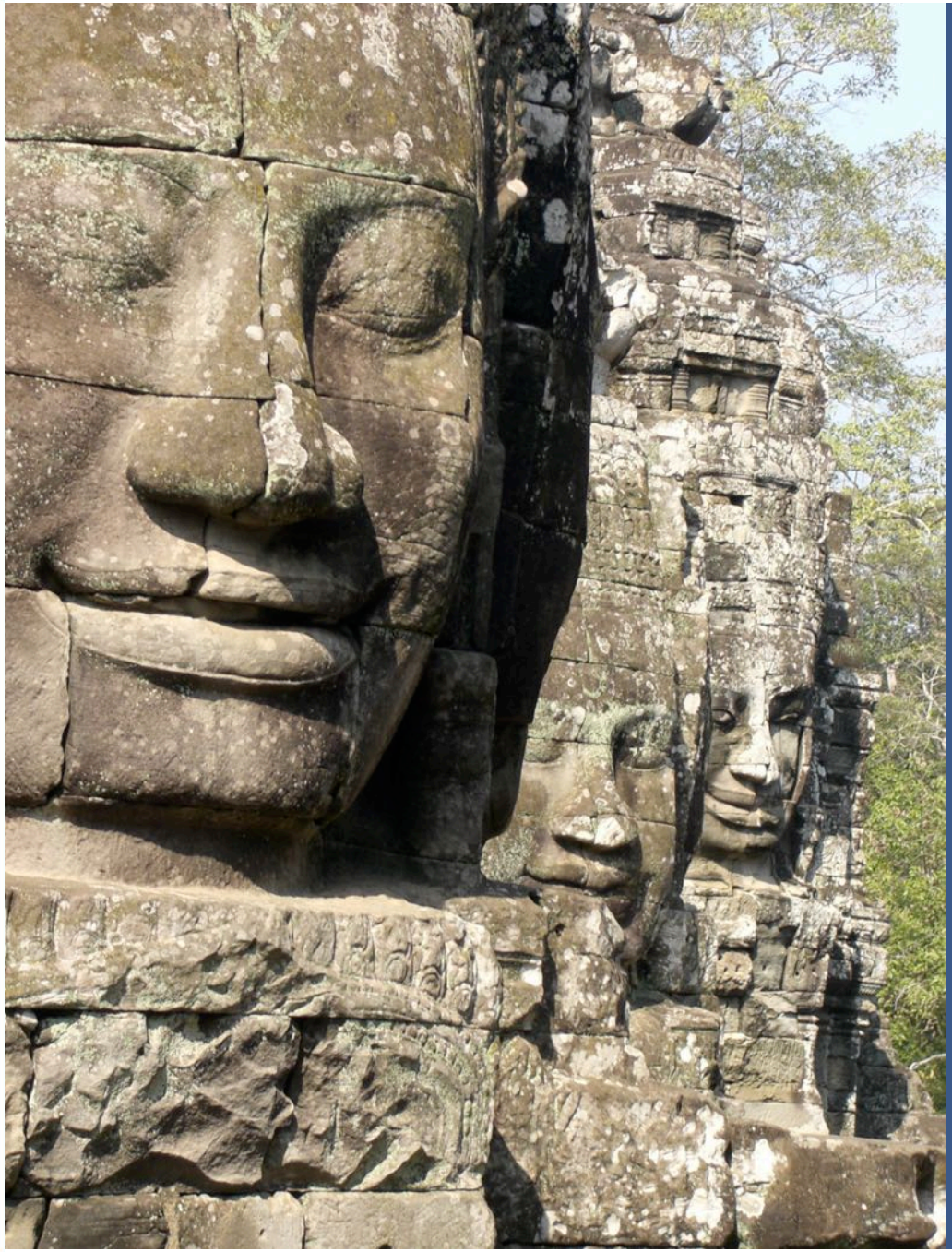
- Yoga can improve pain and function in patients with musculoskeletal disorders
  - Chronic low back and neck pain
  - Osteoarthritis, rheumatoid arthritis, fibromyalgia
- As effective and as safe as other forms of exercise
- No direct dose-response relationship
- But long-term effects depend on continued practice

The Future of Yoga?



Thanks a lot for your attention!

Holger Cramer, PhD
Research Director

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