Prevalence, patterns, and predictors of yoga use: Results of a US nationally representative survey

Holger Cramer, PhD[1,2*], Lesley Ward, PhD[2,3], Amie Steel, PhD[2,4], Romy Lauche, PhD[1,2], Gustav Dobos, MD[1], Yan Zhang, PhD[2,5]

[1]Department of Internal and Integrative Medicine, Kliniken Essen-Mitte, Faculty of Medicine, University of Duisburg-Essen, Essen, Germany.

[2]Australian Research Centre in Complementary and Integrative Medicine (ARCCIM), Faculty of Health, University of Technology Sydney, Sydney, New South Wales, Australia.

[3]Nuffield Department of Orthopaedics, Rheumatology, and Musculoskeletal Sciences (NDORMS), University of Oxford, Oxford, UK.

[4]Endeavour College of Natural Health, Brisbane, Queensland, Australia.

[5]Department of Family and Community Medicine, School of Medicine, Texas Tech University Health Sciences Center, Lubbock, Texas, United States.

***Corresponding author**

Dr. Holger Cramer

Kliniken Essen-Mitte, Klinik für Naturheilkunde und Integrative Medizin

Am Deimelsberg 34a, 45276 Essen, Germany

Phone: +49 201 - 174 25015

Fax: +49 201 - 174 25000

Email: h.cramer@kliniken-essen-mitte.de

Word count: 1,190

Conflict of interest:

The study was not supported by a specific sponsor.

Financial disclosure:

Holger Cramer has received writing fees from the German Association of Yoga Teachers (Berufsverband der Yogalehrenden in Deutschland e.V.; DBY).

Lesley Ward has no financial disclosures.

Amie Steel has no financial disclosures.

Romy Lauche has no financial disclosures.

Gustav Dobos has no financial disclosures.

Yan Zhang has no financial disclosures.

Abstract

Introduction

The purpose of this study was to investigate the prevalence, patterns, and predictors of yoga use in the US general population.

Methods

Using cross-sectional data from the 2012 National Health Interview Survey (NHIS) Family Core, Sample Adult Core, and Adult Complementary and Alternative Medicine questionnaires (n=34,525), weighted frequencies for lifetime and 12-month prevalence of yoga use; and for patterns of yoga practice were analyzed. Using logistic regression analyses, sociodemographic predictors of lifetime yoga use were analyzed. Analyzes were conducted in 2015.

Results

Lifetime and 12-month prevalence of yoga use were 13.2% and 8.9%, respectively. Compared to non-practitioners, lifetime yoga practitioners were more likely female; younger; non-Hispanic White; college educated; higher earners; living in the West; and of better health status. Among those who had practiced in the past 12 months, 51.2% attended yoga classes; 89.9% used breathing exercises; and 54.9% used meditation. Yoga was practiced for general wellness or disease prevention (78.4%), to improve energy (66.1%), or to improve immune function (49.7%). Back pain (19.7%), stress (6.4%) and arthritis (6.4%) were the main specific health problems for which people practiced yoga.

Conclusions

About 31 million US adults have ever used yoga; and about 21 million practiced yoga in the past 12 months. Disease prevention; as well as back pain relief were the most important health

58 reasons for yoga practice. Yoga practice is associated with age, gender, ethnicity,
59 socioeconomic, and health status.
60

Introduction

Rooted in Indian, yoga has nowadays been adapted for use as a complementary and integrative medicine therapy in North America, Australia and Europe[1]. In the latter setting yoga is mainly regarded as a mind-body practice[2], promoting physical and mental well-being through the yoga practices of physical postures (*asana*), breathing techniques (*pranayama*), and meditation (*dyana*)[3].

In recent years, an increasing number of clinical trials have investigated the therapeutic potential of yoga for a variety of medical conditions[4-14]; as well as in preventive medicine[14-17]. A detailed knowledge of current prevalence, patterns, and predictors of yoga use for health reasons is needed to evaluate its overall public health impact.

This current report presents the most recent findings of yoga use from the 2012 NHIS. Specifically, this report examines the lifetime and 12-month prevalence of yoga use; patterns of yoga use; and the prevalence estimates of specific yoga practices in the US general population. Additionally, reasons for using yoga, sources of yoga information, and outcomes of practice were analyzed; and predictors for yoga use identified.

Methods

Data source

This analysis used data from the NHIS 2012, a nationally representative survey that monitors the health of the non-institutionalized US population through the collection of health-related data. Specifically, data from the Family Core, the Sample Adult Core, and the Adult Complementary and Alternative Medicine questionnaire were used for this analysis (see eText for additional information).

A total of 42,366 households were eligible and 34,525 adults provided data (response rate: 79.7%)[18].

Statistical analysis

Weighted distributions and frequencies were analyzed descriptively for lifetime prevalence and 12-month prevalence of yoga use; general information on yoga practice (practice format, costs, patterns of yoga practice); health conditions for which yoga was practiced, reasons for yoga practice, and reported outcomes of yoga practice. Chi square tests were used to compare socio-demographic characteristics between individuals who had ever used yoga and those who had not. Independent predictors of yoga use were identified using multiple logistic regression analysis (see eText for additional information and further analyses). Statistical analysis was performed in 2015 using IBM SPSS ® software (release 20.0, IBM, USA) and STATA (Stata Statistical Software: Release 9. College Station, TX: StataCorp LP).

Results

Prevalence of yoga use

Lifetime prevalence of yoga use for health reasons was 13.2% (n=4,422), representing 31.00 million US adults that had ever practiced yoga (Table 1). One-third (33.7%) of those had told their personal health care provider about their yoga practice. Predictors of ever having used yoga are presented in Table 2. Among those who had ever practiced yoga, 2,974 individuals (67.3%) had also practiced in the past 12 months, representing 20.96 million US adults or a 12-month prevalence of 8.9% (Table 1; see eText and eTable 1 for additional information).

Patterns of yoga use

Among individuals who had practiced yoga in the past 12 months, 51.2% attended yoga classes or received other formal yoga training. The average number of yoga classes attended in the past 12 months was 18.58 ±18.45 (median: XX; range: 1-52); at an average cost per yoga class of US$23.16 ± 28.59 (median: XX; range: $1-$300). The majority of yoga

practitioners included breathing exercises (89.9%) and meditation (54.9%) as part of their yoga practice (see eText and eTables 2-4 for additional information).

Regarding reasons for yoga practice, most respondents reported practicing yoga to improve their general wellness or for general disease prevention (78.4%), to improve their energy (66.1%), or to improve their immune function (49.7%) (Figure 1). Of the 88 medical conditions investigated, back pain (19.7%), stress (6.4%), and arthritis (6.4%) were the top three specific health problems for which people practiced yoga.

The main sources of yoga information used by respondents were DVD's and CDs (36.5%), the Internet (26.9%), and printed media (24.3%) (Figure 1). Most practitioners reported positive outcomes resulting from their yoga practice, predominantly citing reduced stress (84.7%), improved overall health (81.0%), improved emotional well-being (67.5%), improved sleep (59.1%), and increased sense of control over their health (56.9%) as an outcome of their yoga practice (Figure 1).

Discussion

Findings from the 2012 NHIS indicate that the prevalence of yoga use among the US general population has increased markedly over the previous decades, with an estimated 13.2% of US adults ever having practiced yoga in 2012, compared with 7.5% in a 1998 non-NHIS survey[19]. The 12-month prevalence of 8.9% concurs with findings from a previous national survey[20] and indicates a substantial increase in recent yoga use, from 6.1% in the 2007 NHIS survey (relative increase 45.9%)[21] and 5.1% in the 2002 NHIS survey (relative increase 94.1%)[2].

Predictor's of lifetime prevalence of yoga practice are mostly comparable to previous yoga surveys[19,20,22]. Yoga users were more likely to be younger, female, non-Hispanic White, and from the West than non-yoga users. While the 1998 survey found that 'the baby boomer' generation was more likely to practice yoga than younger or older adults[19], already the 2002 NHIS found a clear decrease of yoga use with increasing age[22]. Again in line with previous

surveys, yoga practice was also associated with higher education, higher personal income, and better health status.

As with previous surveys[19,22], the main health reasons for practicing yoga remain musculoskeletal conditions and stress. As the main reported outcomes of yoga practice were improved health and reduced stress, this suggests practitioners may perceive yoga as a form of medical therapy which enables them to self-manage their health; and concurs with patient reports of the use of yoga for management of symptoms of chronic diseases[23,24]. This perception may be aided by the increase in clinical evidence of the effectiveness and safety of yoga for a range of health conditions.

Besides treating specific conditions, almost 80% of respondents practiced yoga to improve their general wellness, or for general disease prevention. Clinical evidence supports the use of yoga to prevent a wide range of health conditions[6,14-16,25-29]. A specific focus on quality of life outcomes within clinical trials has identified yoga practice to improve perceived wellness in a variety of sub-populations including the elderly[30], and women with breast cancer[31,32].

In line with studies on complementary therapies use[33,34], information sources on yoga included 'traditional' sources, like books, magazines, and the media. However, the most commonly used sources were visual ones like videos and the internet, which might be most appropriate for a movement-based practice such as yoga. While prior studies reported the use of mainly nonprofessional information sources[33]more than 6% of yoga users cited scientific articles as an important information source.

See eText for additional discussion of findings.

Limitations

The data were drawn from a cross-sectional survey; as such, the results can only suggest association, not causation. The interpretations which can be drawn from the findings are

strengthened, however, by the regression analysis which controls for confounding variables. The survey is collected by self-report and as such is at risk of recall bias or measurement error.

Conclusion

The number of yoga practitioners in the US general population has substantially increased in recent years. The findings of this study warrant the attention of policy makers responsible for supporting population health, as well as primary care practitioners, yoga specialists and consumers. Continued research attention regarding the clinical benefits of yoga is clearly justified.

Acknowledgments

Holger Cramer has received writing fees from the German Association of Yoga Teachers (Berufsverband der Yogalehrenden in Deutschland e.V.; DBY). No other financial disclosures were reported by the authors of this paper.

Figure captions

Figure 1: Most frequently reported a) reasons for practicing yoga; b) reported sources of information on yoga; and c) outcomes of practicing yoga (% of respondents); n=2,974.

175 Table 1: Weighted socio-demographic characteristics in n (%) for those who had never used
176 yoga, those who had ever use yoga, and those who had used yoga in the past 12 months
177 among adults in the US.

	Never used yoga (n= 195,971,306)	Ever used yoga (n=30,998,492)	Used yoga in the past 12 months (n=20,955,758)
Age			
18 to 29	40,840,640 (20.8%)	8,443,980 (27.2%)	6,160,335 (29.4%)
30 to 39	31,133,741 (15.9%)	7,277,198 (23.5%)	5,201,014 (24.8%)
40 to 49	35,198,461 (18.0%)	5,353,250 (17.3%)	3,656,161 (17.4%)
50 to 64	51,406,839 (26.2%)	7,056,198 (22.8%)	4,425,359 (21.1%)
65 or greater	37,391,625(19.1%)	2,867,866 (9.3%)	1,512,889 (7.2%)
Gender			
Male	100,645,386 (51.4%)	8,688,871 (28.0%)	5,514,996 (26.3%)
Female	95,325,920 (48.6%)	22,309,621 (72.0%)	15,440,762 (73.7%)
Ethnicity / Race			
Non-Hispanic White	128,803,199 (65.7%)	23,752,301 (76.6%)	15,815,420 (75.5%)
Hispanic	31,337,099 (16.0%)	2,745,328 (8.9%)	1,918,602 (9.2%)
Black	24,540,007 (12.5%)	2,166,246 (7.0%)	1,566,946 /7.5%)
Asian	9,699,394 (4.9%)	2,108,214 (6.0%)	1,463,336 (7.0%)
Other	1,591,607 (0.9%)	226,403 (0.7%)	191,454 (0.9%)
Region			
West	41,727,449 (21.3%)	9,783,818 (31.6%)	6,548,938 (31.3%)
Northeast	35,589,375 (18.2%)	5,694,945 (18.4%)	3,720,001 (17.8%)
Midwest	44,565,292 (22.7%)	7,054,995 (22.8%)	4,967,926 (23.7%)

South	74,089,190 (37.8%)	8,464,734 (27.3%)	5,718,893 (27.3%)
Marital status			
Not in a relationship	77,384,569 (29.5%)	12,584,795 (40.6%)	8,532,925 (40.7%)
In a relationship	118,586,737 (60.5%)	18,413,697 (59.4%)	12,422,833 (59.3%)
Education			
Less than college	85,144,107 (43.4%)	4,931,963 (15.9%)	3,074,308 (14.7%)
Some college or more	109,012,782 (55.6%)	26,021,180 (83.9%)	17,844,189 (85.2%)
Income			
Less than $20,000	32,748,201 (16.7%)	6,133,318 (19.8%)	4,205,450 (20.1%)
$20,000 to $34,999	23,539,103 (12.0%)	3,965,394 (12.8%)	2,681,419 (12.8%)
$35,000-$64,999	29,804,649 (15.2%)	5,895,656 (19.0%)	4,266,260 (20.4%)
$65,000 or more	19,728,380 (10.1%)	5,296,914 (17.1%)	3,675,774 (17.5%)
Health status			
Poor to fair	27,318,219 (13.9%)	1,820,562 (5.9%)	1,092,031 (5.2%)
Good to excellent	168,549,959 (86.0%)	29,174,809 (94.1%)	19,860,606 (94.8%)

178

179 Table 2: Predictors associated independently with having ever used yoga among adults in the

180 US.

	Adjusted odds ratio (95% confidence interval)
Age	
18 to 29	1.00 (Reference)
30 to 39	0.90 (0.80,1.02)
40 to 49	0.62 (0.54,0.70)
50 to 64	0.50 (0.44,0.56)
65 or greater	0.48 (0.39,0.51)
Gender	
Male	1.00 (Reference)
Female	3.22 (2.95,3.52)
Ethnicity / Race	
Non-Hispanic White	1.00 (Reference)
Hispanic	0.53 (0.46,0.61)
Black	0.49 (0.42,0.58)
Asian	0.78 (0.66,0.93)
Other	0.84 (0.52,1.36)
Region	
West	1.00 (Reference)
Northeast	0.64 (0.56,0.72)
Midwest	0.58 (0.51,0.65)
South	0.49 (0.44,0.55)
Marital status	

Not in a relationship	1.00 (Reference)
In a relationship	0.87 (0.80,0.95)
Education	
Less than college	1.00 (Reference)
Some college or more	2.83 (2.52,3.17)
Income	
Less than $20,000	1.00 (Reference)
$20,000 to $34,999	0.96 (0.85,1.08)
$35,000-$64,999	1.13 (1.01,1.27)
$65,000 or more	1.69 (1.48,1.92)
Health status	
Poor to fair	1.00 (Reference)
Good to excellent	1.29 (1.05,1.58)

181

182

References

1. De Michaelis E. *A history of modern yoga: Patanjali and western esotericism*. London, UK: Continuum International Publishing Group; 2005.
2. Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children: United States, 2007. *Natl Health Stat Report*. 2008(12):1-23.
3. Feuerstein G. *The yoga tradition*. Prescott: Hohm Press; 1998.
4. Bussing A, Ostermann T, Ludtke R, Michalsen A. Effects of yoga interventions on pain and pain-associated disability: a meta-analysis. *J Pain*. 2012;13(1):1-9.
5. Cramer H, Lauche R, Haller H, Dobos G. A systematic review and meta-analysis of yoga for low back pain. *Clin J Pain*. 2013;29(5):450-60.
6. Ward L, Stebbings S, Cherkin D, Baxter GD. Yoga for functional ability, pain and psychosocial outcomes in musculoskeletal conditions: a systematic review and meta-analysis. *Musculoskeletal Care*. 2013;11(4):203-17.
7. Buffart LM, van Uffelen JG, Riphagen, II, et al. Physical and psychosocial benefits of yoga in cancer patients and survivors, a systematic review and meta-analysis of randomized controlled trials. *BMC Cancer*. 2012;12:559.
8. Cramer H, Lange S, Klose P, Paul A, Dobos G. Yoga for breast cancer patients and survivors: a systematic review and meta-analysis. *BMC Cancer*. 2012;12:412.
9. Cramer H, Lange S, Klose P, Paul A, Dobos G. Can yoga improve fatigue in breast cancer patients? A systematic review. *Acta Oncol*. 2012;51(4):559-60.
10. Lin KY, Hu YT, Chang KJ, Lin HF, Tsauo JY. Effects of yoga on psychological health, quality of life, and physical health of patients with cancer: a meta-analysis. *Evid Based Complement Alternat Med*. 2011;2011:659876.
11. Posadzki P, Cramer H, Kuzdzal A, Lee MS, Ernst E. Yoga for hypertension: A systematic review of randomized clinical trials. *Complement Ther Med*. 2014;22(3):511-522.
12. Cramer H, Haller H, Lauche R, Steckhan N, Michalsen A, Dobos G. A Systematic Review and Meta-Analysis of Yoga for Hypertension. *Am J Hypertens*. 2014.
13. Innes KE, Bourguignon C, Taylor AG. Risk indices associated with the insulin resistance syndrome, cardiovascular disease, and possible protection with yoga: a systematic review. *J Am Board Fam Pract*. 2005;18(6):491-519.
14. Cramer H, Lauche R, Haller H, Steckhan N, Michalsen A, Dobos G. Effects of yoga on cardiovascular disease risk factors: a systematic review and meta-analysis. *Int J Cardiol*. 2014;173(2):170-83.
15. Chong CS, Tsunaka M, Tsang HW, Chan EP, Cheung WM. Effects of yoga on stress management in healthy adults: A systematic review. *Altern Ther Health Med*. 2011;17(1):32-8.
16. McCall MC, Ward A, Roberts NW, Heneghan C. Overview of systematic reviews: yoga as a therapeutic intervention for adults with acute and chronic health conditions. *Evid Based Complement Alternat Med*. 2013;2013:945895.
17. Cramer H, Lauche R, Langhorst J, Dobos G. Yoga for depression: a systematic review and meta-analysis. *Depress Anxiety*. 2013;30(11):1068-83.
18. Blackwell DL, Lucas JW, Clarke TC. Summary health statistics for U.S. adults: national health interview survey, 2012. *Vital Health Stat 10*. 2014(260):1-161.
19. Saper RB, Eisenberg DM, Davis RB, Culpepper L, Phillips RS. Prevalence and patterns of adult yoga use in the United States: results of a national survey. *Altern Ther Health Med*. 2004;10(2):44-9.
20. Yoga Journal. Yoga Journal releases 2012 yoga in America market study. Yoga Journal 2012. http://www.yogajournal.com/article/press-releases/yoga-journal-releases-2012-yoga-in-america-market-study/.
21. Barnes PM, Powell-Griner E, McFann K, Nahin RL. Complementary and alternative medicine use among adults: United States, 2002. *Adv Data*. 2004(343):1-19.

22. Birdee GS, Legedza AT, Saper RB, Bertisch SM, Eisenberg DM, Phillips RS. Characteristics of yoga users: results of a national survey. *J Gen Intern Med*. 2008;23(10):1653-8.

23. Der Ananian CA, Wilcox S, Abbott J, et al. The exercise experience in adults with arthritis: a qualitative approach. *Am J Health Behav*. 2006;30(6):731-44.

24. Ward L, Treharne GJ, Stebbings S. The suitability of yoga as a potential therapeutic intervention for rheumatoid arthritis: a focus group approach. *Musculoskeletal Care*. 2011;9(4):211-21.

25. Rakhshani A, Nagarathna R, Mhaskar R, Mhaskar A, Thomas A, Gunasheela S. The effects of yoga in prevention of pregnancy complications in high-risk pregnancies: A randomized controlled trial. *Prevent Med*. 2012;55(4):333-40.

26. Tuomilehto J, Lindström J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine*. 2001;344(18):1343-1350.

27. Brown KD, Koziol JA, Lotz M. A yoga-based exercise program to reduce the risk of falls in seniors: a pilot and feasibility study. *The Journal of Alternative and Complementary Medicine*. 2008;14(5):454-457.

28. Tiedemann A, O'Rourke S, Sesto R, Sherrington C. A 12-week Iyengar yoga program improved balance and mobility in older community-dwelling people: a pilot randomized controlled trial. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*. 2013;68(9):1068-1075.

29. Fishman LM. Yoga for osteoporosis: A pilot study. *Topics in Geriatric Rehabilitation*. 2009;25(3):244-250.

30. Oken BS, Zajdel D, Kishiyama S, et al. Randomized, controlled, six-month trial of yoga in healthy seniors: effects on cognition and quality of life. *Alternative Therapies in Health and Medicine*. 2006;12(1):40.

31. Moadel AB, Shah C, Wylie-Rosett J, et al. Randomized controlled trial of yoga among a multiethnic sample of breast cancer patients: effects on quality of life. *Journal of Clinical Oncology*. 2007;25(28):4387-4395.

32. Chandwani KD, Thornton B, Perkins GH, et al. Yoga improves quality of life and benefit finding in women undergoing radiotherapy for breast cancer. *Journal of the Society for Integrative Oncology*. 2009;8(2):43-55.

33. Frawley J, Adams J, Broom A, Steel A, Gallois C, Sibbritt D. Majority of women are influenced by nonprofessional information sources when deciding to consult a complementary and alternative medicine practitioner during pregnancy. *J Altern Complement Med*. 2014;20(7):571-7.

34. Evans M, Shaw A, Thompson EA, et al. Decisions to use complementary and alternative medicine (CAM) by male cancer patients: information-seeking roles and types of evidence used. *BMC Complement Altern Med*. 2007;7:25.