

A Systematic Review of Yoga for Mental and Physical Health in College Students

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Abstract

College students often suffer from stress, anxiety, depression, sleep related problems, and also struggle with substance use, and issues related to academic performance. Yoga is currently used as an evidence-based, therapeutic intervention for college students by researchers. This literature review focuses on 94 college-based studies utilizing yoga interventions published in peer-reviewed journals from 2000 to 2016. Studies from these publications primarily come from India (45%) and the United States (39%). This review article addresses variation in yoga intervention protocols, mainly methodology and duration. Most of the studies reviewed address major limitations with research design and implementation, both of which are important aspects to consider within the growing field of scientific yoga research. Regardless, these published studies indicate that the use of yoga within the college setting is an important, and growing area of research.

Keywords: Yoga, meditation, college students, mental & physical health

Background

Research has shown that regular, long-term practice of yoga helps improve the body, mind, and spirit, and acts as a guide towards a healthier and more fulfilling life.^{1, 2} Although modern society often thinks of yoga as a form of physical exercise, traditionally yoga as codified by Patanjali is a multi-component discipline (*Ashtanga Yoga*) involving postures, breath regulation techniques, controlling attention, and practicing meditation to enhance mindful awareness.²

Universities are increasingly exploring integrative approaches within the student health services, including exploration of Complementary and Alternative Medicine (CAM) which incorporate postures and mindfulness. Research has consistently demonstrated a positive relationship between CAM use and education level and CAM use among college students is higher compared to the general population.^{3,4,11}

The objectives of this rigorous systematic review are to: (1) identify all relevant published studies that apply yoga intervention to college students; (2) identify

areas in which yoga is effective for college students; and (3) draw conclusions about which areas have better impact, and improvement for future implementation.

Based on this literature review, most yoga studies on college students focus on examining the following parameters: emotional health, academic performance, substance use, sleep, and physiological parameters. Emotional health parameters defined in the articles primarily consist of stress, anxiety, and depression.

Stress: College students have to adapt to new social situations, rigorous academic workload, and greater financial responsibilities.⁵ Not coping well with transition has been correlated with lower course grades and decreased social and general problem-solving ability.⁶ Stress is high among college populations and can trigger underlying vulnerabilities for many psychological disorders.⁷ Though stress at low levels could be beneficial and motivating, a majority (53.5%) of college students report that their stress levels are above average and/or extreme.⁶ Yoga is

related to increasing levels of awareness and mindfulness, and researchers have shown that there is a clear link between yoga practice and stress reduction.⁸

Anxiety: Failure to effectively deal with stress can cause anxiety.⁹ Both stress and anxiety are known to negatively affect concentration, memory, problem-solving skills, and academic performance, often leading to illness, depression, avoidance, and other psychosomatic and/or physical problems.¹⁰ Behavior modification techniques such as yoga and meditation have shown to minimize test-taking and other types of anxiety.¹¹

Depression: Depression is one of the most prevalent mental disorders in the United States.¹² Symptoms observed among college students include weight gain or loss, insomnia or oversleeping, decreased ability related to concentration, lower grade point average, and low self-esteem,^{13,14} Evidence-based research supports the efficacy of psychosocial interventions for major depressive disorders).¹⁵

Substance Use: Increase in stress in college students often leads to unhealthy coping methods, such as use of alcohol and drugs, and there is a strong correlation among college populations between stress-related symptoms and substance abuse.¹⁶ Furthermore, binge drinking during college predicts failure to achieve educational goals.¹⁷

Academic Performance: Academic performance problems due to stress may lead to adverse educational outcomes, and eventual dropout from college.¹⁸ Students who suffer from anxiety perform significantly poorer on course exams compared to their peers, and depression is associated with a decrease in half a letter grade of the end-of-year cumulative semester GPA.¹⁹ A significant change is observed in the level of subjective well-

being and academic performance related to the adolescents practicing yoga.²⁰

Sleep: A potential obstacle in maximizing success in college is irregular sleep behaviors, defined as high prevalence of daytime sleepiness, sleep deprivation, and irregular sleep schedules.²¹ Daytime sleepiness is a major problem, exhibited by about 50% of college students and may have consequences such as poor learning, memory, deficits in attention and academic performance, drowsy driving, increased risk-taking behavior and depression, impaired social relationships and overall poorer health.^{22,23} Recent studies on sleep and mindfulness techniques as well as cyclic meditation show significant improvement in the subjective quality of sleep.²⁴

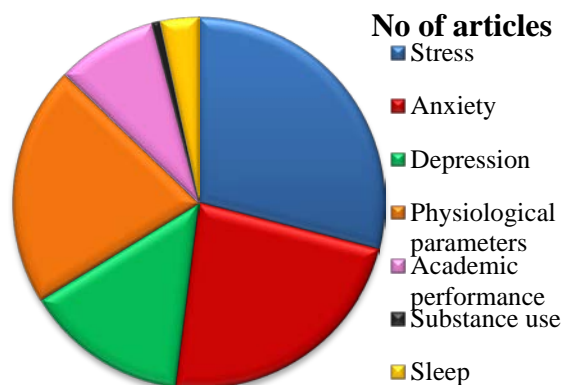
Methods

To examine effects of yoga on college students, we conducted systematic searches using several databases from years 2000 to 2016. We explored databases including Scopus, PubMed, Cochrane Library, ProQuest, PsycINFO, OneSearch, CamQuest and CamBase. We also searched the reference lists of included papers and review articles. The following search terms were used: yoga; mindfulness; meditation and college students; young adults. Non-peer-reviewed studies, including doctoral dissertations, were not included. Some peer-reviewed articles used terms such as ‘postures’ or ‘mindfulness,’ but if there was no specific mention of the word ‘yoga,’ they were excluded from the review. Database searches yielded 144 abstracts, which were examined for the use of yoga interventions on college students. For abstracts that appeared to meet the review criteria, full-text articles were retrieved and assessed. A total of 94 publications met the above defined search criteria. We extracted the following information from articles: year, country, sample size, parameters assessed, and yoga protocol details. Weekly duration

was not specified accurately in some trials and was approximated to the closest value. Descriptive statistical analysis was performed on the extracted data.

Results

Hatha yoga was the most common type of yoga used by researchers as an intervention. The characteristics of all reviewed protocol are summarized in Table 1, in chronological order. There is consistent increase in publications since 2000, and a spike in studies on college students and yoga around 2013. The trend has wavered a noticeable amount; with more than 25% peer reviewed journal articles published in 2016 alone. The majority of research seems to be conducted in India (45%), with the U.S. (39%) in second place. The ‘other’ category includes - China, Canada, Iceland, Oman, Spain, Poland, Brazil, and Australia.



Graph 1. Areas examined to evaluate effects of yoga in college student population

Distribution of articles focused on each parameter is shown in Graph 1. About 73% of the articles focused on emotional health with 45% on stress, 36% on anxiety, and 22% on depression.

Studies seem to vary in length, from a single session, up to recurrent sessions over twenty-four weeks (Table 1). Sample size in the research protocols ranged from 12-584, which included a control as well as other comparison groups. Majority of participants in most protocols ranged from 21-30 in age.

Stress in this population affects first-year adjustment, and one of the studies utilized mindfulness interventions in this population to assess adjustment using diurnal cortisol measurements.¹¹² The yoga intervention led to a decrease in stress levels, especially in male participants.¹¹² This is an important finding, as usually, females seem to self-select yoga-related activities. Another study conducted to examine the effects of yoga on interpersonal relationship and adjustment in college students finds that the intervention leads to a positive, significant change.¹⁰⁵ Improvement in the parasympathetic activity, coupled with a decrease in the sympathetic activity suggests that yoga has an effect on modulation of sympathovagal balance, and overall enhanced sense of well-being.⁸⁹

Studies suggest that there is a significant increase in sustained attention scores in university students following yoga administration, which may show that yoga is associated with an increase in sympathetic activity and in turn, greater alertness and vigilance.⁶⁷

Changes in sleep pattern due to yoga are not studied in-depth, but the few, existing studies do show positive outcomes. Studies utilizing *pranayama* and *yoga nidra* administration are correlated with an increase in alertness and better sleep.³⁹ Self-reporting by college students who underwent *yoga nidra* practices also indicate relaxation and better sleep patterns.^{62, 26} Sun salutations as interventions in college students resulted in a significant reduction in sleepiness, as well as lowered stress disposition, while medical students receiving yoga intervention self-reported improvement in sleep quality.^{55, 84}

Practicing breathing exercises has been shown to modulate autonomic nervous system responses by reducing sympathetic activity and increasing parasympathetic

activity measured through heart rate, blood pressure, and respiratory rate.⁸⁹

Discussion

To our knowledge, this review is the first to include a systematic approach providing a summary of the current evidence on the benefits of practicing yoga for college students. Previous reviews have primarily focused on mindfulness intervention or only in a few impact areas such as substance use or emotional health. This systematic analysis provides the data to assess likely impact on outcome in the areas of physiological health, emotional health, sleep, substance use, and academic performance.

There seems to be steady attention and an increase in studies examining the effects of yoga on the college student population. Most articles about yoga and college students seem to come from India, and this may be due to the fact that yoga has roots in India. Emotional health parameters such as stress, anxiety, and depression have been studied the most in college students. Literature shows that yoga intervention increases immune function and promotes brain activity in areas associated with positive emotions, reduces anxiety and negative affect, and prevents relapse of depression.³³

Most studies on sleep seem to show that activity trackers are simple tools in gathering sleep data, however, there are accuracy and reliability issues with these devices. Sleep labs are utilized for accurate, quantitative measurements of sleep parameters, but sleep studies require elaborate and time-consuming assessments conducted by trained, skilled personnel.

The effects of yoga on substance use in college have been studied the least; this may be due to social stigma associated with binge drinking, among other reasons. Also, college students may not readily want to admit being part of the peer pressure

culture, thereby resulting in bias when self-reporting. Smokers within the college population often seek alternative interventions to stop smoking, and meditation seems to be an intervention which could be utilized to counter nicotine cravings. Out of all articles reviewed, about 15% of the articles focused on the effects of yoga on medical, nursing, dental and therapy students. Yoga intervention showed positive effects on these students in terms of lowering stress, increased alertness, and having a better disposition. Regardless of the variation in yoga protocols, all reviewed articles showed positive impact on college students. There were no adverse events reported by any studies. Some studies used exclusively *hatha yoga* components, while others administered a variety of protocols including *asanas*, *pranayama*, and meditation. A few articles also focused on relaxation techniques such as *shavasana* and *yoga nidra*. Though variations in protocols exist, a few studies showed that a combination of postures, breath, and meditation seem to have the maximum desired impact versus using single modality.

Challenges and Limitations

Many of the articles reviewed discussed similar types of challenges - small sample size, randomization and potential issues introduced due to selection bias and lack of blinding. Drop-out rates and lack of follow up pose challenges in measuring and assessing long-term effects of yoga intervention in college students. Longer duration of the study is associated with more drop-out rates; this is a serious challenge in yoga research.

Funding for yoga related research is relatively low and may discourage interested researchers from pursuing this field of study.

Conclusion

Yoga intervention, in general is a relatively new area within health policy. Yoga does

not replace biomedicine treatment modalities, but holistically enhances college students' ability to cope and even excel in their academic environment. Our review is consistent with the summation of others and concludes that yoga is a feasible practice that may promote improvement in many areas for college students.

Future directions of yoga research could incorporate introduction of didactic knowledge about yoga in the college

curriculum. Greater, evidence-based, randomized controlled trials, utilizing standardized yoga protocols designed to assess quantitative measures, including genetics and biomarkers, are the future of yoga research.

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Table 1: Summary of research articles reviewed

No.	Author	Year	Location	Parameters	Sample size	Duration (weeks)
1	Birkel	2000	USA	Lung vital capacity	287	4
2	Sahajpal	2000	India	Perceived Stress	12	4
3	Deckro	2002	USA	Psychological distress	128	5
4	Rosenzweig	2003	USA	Perceived Stress	90	16
5	Beddoe	2004	USA	Empathy	16	8
6	West	2004	USA	Perceived Stress	69	8
7	Woolery	2004	USA	Depression	28	6
8	Muller	2006	USA	Emotional well being	584	8
9	Jain	2007	USA	Well-being	81	4
10	Hackett	2008	Oman	Heart rate	12	24
11	Kumar	2008	India	Perceived Stress	80	8
12	Oman	2008	USA	Perceived Stress	44	8
13	Schure	2008	USA	Perceived changes	33	3
14	Cohen	2009	USA	Well-being	20	12
15	Kumar	2009	India	EEG	40	8
16	Rizzolo	2009	USA	Blood pressure	22	11
17	Simard	2009	Canada	Perceived Stress	14	8
18	Kumar	2010	India	Guilt	80	6
19	Gopal	2011	India	Biochemical parameters	60	3
20	Lynch	2011	USA	Anxiety	16	8
21	Shapiro	2011	USA	Perceived stress	30	20
22	Xu	2011	China	Physical health	25	14
23	Kasturi	2012	India	Blood pressure	65	6
24	Kondam	2012	India	Respiratory functions	35	4
25	Newsome	2012	USA	Perceived Stress	31	8
26	Shankarapillai	2012	India	Anxiety	100	12
27	Shapiro	2012	USA	Well-being	25	6

28	Subramanian	2012	India	Hematological parameters	43	6
29	Yamada	2012	USA	Well-being	60	8
30	Akhtar	2013	India	Musculoskeletal function	30	9
31	Bansal	2013	India	Somatic symptoms	82	12
32	Barbosa	2013	USA	Anxiety	33	2
33	Bergen-Cico	2013	USA	Psychological distress	119	8
34	Bond	2013	USA	Self-regulation	27	6
35	Byrne	2013	USA	Anxiety	112	8
36	de Vibe	2013	Norway	Mental distress	288	8
37	Dhebar	2013	India	Lung function	60	8
38	Eastman-Mueller	2013	USA	Perceived stress	66	8
39	Gockel	2013	USA	counseling skill	132	4
40	Kanojia	2013	India	Blood Pressure	50	16
41	Kumar	2013	India	Lung function	50	14
42	Mehta	2013	India	Psychological well being	36	8
43	Nagendra	2013	India	Sustained attention	66	4
44	Ojha	2013	India	Well being	104	12
45	Tikhe	2013	India	Brain wave coherence	30	8
46	Call	2014	USA	Anxiety	91	8
47	Demarzo	2014	Brazil	Perceived stress	23	3
48	Gallego	2014	Spain	Stress	125	8
49	Gaskins	2014	USA	Perceived Stress scale	20	4
50	Goodman	2014	USA	Mindfulness	13	14
51	Karthik	2014	India	Respiratory functions	50	24
52	Kim	2014	Korea	Blood glucose level	27	24
53	Kumar	2014	India	Anxiety	30	7
54	Nelson	2014	USA	Blood pressure	56	1
55	Parikh	2014	India	Respiratory functions	39	4
56	Thangavel	2014	India	Hand grip strength	91	12
57	Thangavel	2014	India	Respiratory functions	91	12
58	Tikhe	2014	India	Emotional sensitivity	184	4
59	Canby	2015	USA	Psychological distress	34	10
60	Godse	2015	India	Stress dispositions	419	8
61	Halland	2015	Norway	Mental distress	288	10
62	Hjeltnes	2015	Norway	Anxiety	29	8
63	Kiken	2015	USA	Mindfulness	235	12
64	Lim	2015	Korea	Antioxidant level	25	3
65	Nagendra	2015	India	EEG	30	16
66	Sahu	2015	India	EEG	50	4
67	Singh	2015	India	Aggression level	30	4
68	Song	2015	Korea	Depression	44	1
69	Wongtongkam	2015	Australia	Angry emotions	96	6
70	Aherne	2016	Ireland	Stress reduction	228	7
71	Ahmad	2016	India	Physiological	30	12
72	Bashir	2016	India	Aggressive behavior	160	1
73	Bhagal	2016	India	Memory score	45	5

74	Chowdhary	2016	India	Blood pressure	100	10
75	Dundas	2016	USA	Anxiety	46	3
76	Falsafi	2016	USA	Depression	90	15
77	Goldstein	2016	USA	Stress	74	10
78	Grabara	2016	Poland	Range of motion of spine	59	13
79	Jain	2016	India	Cardiac function	60	6
80	Kondam	2016	India	Attention	80	24
81	Kumar	2016	India	Social adjustment level	90	24
82	Lona	2016	USA	Happiness	27	6
83	Nins	2016	India	Muscular endurance	60	12
84	Mcindoo	2016	USA	Depression	50	6
85	Negi	2016	India	Flexibility	40	7
86	Patelia	2016	India	Educational aspiration	60	1
87	Polsgrove	2016	USA	Balance	26	10
88	Ramler	2016	USA	College adjustment	62	8
89	Saoji	2016	India	Cognitive functions	42	2
90	Sharma	2016	India	Blood glucose	20	14
91	Shearer	2016	USA	Heart rate	74	7
92	Signh	2016	India	Anxiety	50	4
93	Suri	2016	India	Pain perception	60	12
94	Yang	2016	Korea	Menstrual cramps	40	8

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