Original Article

Effect of Yoga on Stress, Anxiety, Depression, and Spinal Mobility in Computer Users with Chronic Low Back Pain

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Abstract

Background: Office workers who need to use a computer while maintaining a static position for prolonged periods have more chance of having low back pain (LBP). **Objective:** The objective of the study is to investigate the effect of yoga on stress, anxiety, depression, and spinal mobility in computer users with chronic LBP (CLBP). **Materials and Methods:** In this randomized control trial, eighty computer users (42.6 ± 8.45 years of age; suffering from CLBP since 5.20 ± 3.01 years; 51 males and 29 females) who use a computer for their professional work, recruited from Bengaluru, India, were randomized into two groups: yoga group (n = 40) and physical exercise group (n = 40). The yoga group practiced an integrated module comprising yoga postures and mindfulness meditation, and the physical exercise group practiced physical exercise designed for LBP (1 h/day, 3 days/week for 16 weeks). Assessments of dial-type goniometer and Depression Anxiety Stress Scale-42 were performed at baseline, after 8 weeks, and after 16 weeks. **Results:** Stress, anxiety, and depression scores were significantly lower in the yoga group as compared to the physical exercise group at 16 weeks ($P < 0.001$), whereas spinal flexion ($P < 0.001$), spinal extension ($P < 0.001$), right lateral flexion ($P = 0.001$), and left lateral flexion ($P = 0.007$) scores were significantly higher in the yoga group as compared to the physical exercise group at 16 weeks. **Conclusion:** Yoga is more effective in reducing stress, anxiety, and depression and improving spinal mobility in computer users with CLBP than physical exercise designed for LBP.

Keywords: *Anxiety, back pain, depression, mindfulness, stress, yoga*

Introduction

Back pain affects most adults and it is a common reason for seeking health care.[1] If a person experiences difficulty in the lower back region, especially below the medial margin and in the inferior gluteal folds, then it is called low back pain (LBP).[2] LBP is usually mechanical or nonspecific. Nonspecific LBP refers to LBP that arises from the spine, intervertebral disks, or surrounding soft tissues.[3] LBP has been regarded as one of the major causes of disability worldwide.[4] Chronic LBP (CLBP) occurs when the LBP persists for more than the period of 12 weeks and more.[5] Recent studies, which were conducted in the general population, have shown about 84% lifetime prevalence of LBP, 23% of CLBP, and 12% of LBP with a major disability.[6] It has been often observed that the prevalence of LBP is directly proportional to age as there are reduced physical activities as the age factor increases.[5,7]

Various factors are associated with LBP. Automated life, increased computer use, reduced physical activity, and exposure to various kinds of diseases and musculoskeletal disorders are the common contributors to LBP.[8] Studies also demonstrated that genetic factor has one of the major roles in CLBP, along with biomechanical and other physical activities.[6] As known, CLBP is developed in the lumbar intervertebral discs, the sacroiliac joints, and the apophyseal joints.[9] Therefore, it is most commonly related to structural pathologies such as intervertebral disc prolapse and endplate fractures. However, the latest studies demonstrated that postural habits are responsible for tissue disruption.[9] Studies also revealed that CLBP is associated with poor socioeconomic status and mental conditions.[10] Pain and disability are the most challenging factors of LBP[2] which are further associated with psychological

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factors.[11] Hence, psychological stress, anxiety, and depression are strongly connected with CLBP, and people with CLBP are more likely to develop anxiety and depression disorders.[8,12,13]

The latest surveys showed that CLBP is two and half times more prominent in the working population as compared to the nonworking population.[5] Similarly, office workers who need to use a computer keyboard while maintaining a static position for prolonged periods have more chance of having LBP.[8] Since muscular movement is necessary for coordination, long-term postures might affect intervertebral discs.[14] The latest study showed that there was a 60% prevalence of LBP in computer users in universities.[15] Furthermore, studies demonstrated that the chances of getting LBP reduce with a rise in short breaks while using computers.[15] In a study conducted in Punjab, India, there was a 40.40% 1-year prevalence of LBP among computer users in banks.[16]

It is suggested that surgical procedures and too much medication should be avoided because of adverse side effects in CLBP.[6] However, yoga therapy can be one of the effective treatment options for CLBP. Yoga deals with the techniques to unite the individual consciousness with the universal consciousness; however, studies have demonstrated significant improvement in physical and psychological aspects followed by yoga.[17] In general, people consider yoga as a kind of mind–body technique, which includes sitting meditation and bodily postures.[18] However, it is a holistic practice that deals with the health of the human body, mind, and soul.[19] The diverse aspects of yoga including breathing practices, awareness, maintenance of postures, and relaxation can play a major role to cure various lifestyle diseases along with CLBP.[20] Similarly, the mindfulness of breathing (Anapanasati) is one of the most common forms of mindfulness meditation. In Anapanasati, practitioners continually focus on the sensations of their breathing[21] with the clinical aim of improving mental and physical health.[22]

Due to a modern sedentary lifestyle among the working populations, the body is underutilized, and the cognitive and intellectual aspects of the mind are overutilized at the cost of emotional imbalance, leading to a scenario where musculoskeletal disorders such as CLBP have become a norm, accompanied by stress and other psychological issues.

In such a scenario, there is a need to explore the role of profound and timeless disciplines like yogic practices – both physical and mindfulness mental practices in mitigating the problem, not just as a palliative but also as a comprehensive curative alternative discipline. This also becomes important in a time where pharmacological and surgical solutions have become the norm.

Materials and Methods

Participants and sample size calculation

Eighty computer users (mean age = 42.6 ± 8.45 years; suffering from CLBP since 5.20 ± 3.01 years; 51 males and 29 females) were recruited from Bengaluru, India. The calculated sample size for each group was 24 based on earlier similar studies (power = 0.95 and alpha = 0.05).[23,24] Considering the possible attrition rate of up to 40%, the final sample size was set as 80: 40 in the yoga group and 40 in the physical exercise group.

Selection criteria

Subjects between 25 and 64 years[25] who use a computer for their professional work for at least 6 h/day, 5 days in a week,[26] with current LBP persisting at least for 12 weeks with average pain intensity not <4 for the previous week on an 11-point Numerical Rating Scale[27] with or without radiation to legs[28] were recruited for the study. Subjects having specific causes of LBP including spinal canal stenosis, spondylolisthesis Grade II or more, ankylosing spondylitis, moderate-to-severe scoliosis, malignancy, and fracture were excluded.[27] Those with severe obesity, life-threatening comorbid conditions, critical illness, recommended surgical intervention, and the inability of practicing yoga or exercise were also excluded from the study. Similarly, subjects having indications of serious spinal neurologic abnormality (difficulty passing urine; numbness around the back passage, genitals, or inner thighs; numbness, pins, and needles or weakness in both legs; or unsteadiness on feet) were also excluded.[29] In addition, regular practitioners of yoga (at least once a week for 1 month or more in the past 6 months) and women with pregnancy were excluded.

Study design

The study was a prospective randomized active-control trial with 16 weeks of follow-up investigating the effect of yoga and mindfulness meditation on stress, anxiety, depression, and spinal flexibility in computer users with chronic LBP. Eighty computer users satisfying the selection criteria were randomized into two groups: the yoga group (n = 40) and the physical exercise group (n = 40) after obtaining signed informed consent from every participant. The allocations were concealed. The yoga group practiced an integrated module comprising yoga postures and mindfulness meditation intervention for 16 weeks (1 h/day and 3 days/week). Similarly, the physical exercise group practiced a physical exercise module for the same duration. Assessments were performed at baseline, after 8 weeks, and after 16 weeks. The assessors and statisticians were unaware of the intervention assignment status of the subjects. The institutional ethical clearance was obtained before starting the trial. The trial was registered in the Clinical Trials Registry India (CTRI/2020/12/029944).

Randomization and allocation concealment

The study physician recruited the subjects after screening them as per the selection criteria. The allocation schedule of the subjects was concealed from the physician (through a random computer-generated number coding system). For each eligible subject, a recruitment form was sent to a research assistant. Using an online randomization software, the research assistant randomly assigned each subject to either the yoga group or the physical exercise group.

Assessments

All the assessments were done as per the standard guidelines. The assessments of the dial-type goniometer and Depression Anxiety Stress Scale-42 (DASS-42) were performed at baseline, after 8 weeks, and after 16 weeks for both the groups. The assessor that performed the assessments was blind to the intervention assignment status of the subjects.

Depression Anxiety Stress Scale-42

DASS-42 consists of 42 items divided into 3 subscales of 14 items: depression, anxiety, and stress. The DASS-42 is a global measure of depression, anxiety, and stress.[30] The instrument is internally consistent and valid.[31]

Dial-type goniometer

Spinal mobility was assessed using a dial-type goniometer manufactured by Anand Agencies, Pune, India.[24] The goniometer instrument has a dial with calibrations from 0° to 360° that is tied around the waist. The values for the ranges of movement for spinal flexion (SF), spinal extension (SE), right lateral flexion (RLF), and left lateral flexion (LLF) are read on the dial and noted in degrees.

Interventions

Yoga group

The yoga group practiced an integrated module comprising yoga postures and mindfulness meditation (Anapanasati/ mindfulness of breathing) specifically designed to reduce stress, pain, and stiffness in LBP, 1 h/day, 3 days/week for 16 weeks. The first 8 weeks of sessions were supervised, followed by 8 weeks of home practice assisted by the guided audios and videos. They also got lifestyle advice based on yoga philosophy to improve mental and physical health. The details of the program are provided in Table 1.

Physical exercise

The physical exercise group practiced a physical exercise module designed to improve the mechanical structure of the lower spine, 1 h/day, 3 days/week for 16 weeks. As in the yoga group, the first 8-week physical exercise sessions were supervised, followed by the 8-week home practice assisted by the guided videos and audios. The physical exercise group was also given health education and lifestyle advice as per the conventional norms. Table 1 provides the details of the physical exercise program.

The above intervention programs (yoga and physical exercise) were an add-on to conventional management which included medications mostly nonsteroidal anti-inflammatory drugs and muscle relaxants. They were prescribed by an orthopedic surgeon.

Statistical analysis

The data of study completers (n = 77; 39 in the yoga group and 38 in the physical exercise group) were analyzed in the per-protocol approach using SPSS (Statistical Package for Social Sciences version 24, IBM Corporation Business Analytics Software Portfolio, Chicago, Illinois, USA). The analysis was performed by applying repeated measures analysis of variance with a between-subject fixed-effects factor with two levels (yoga and physical exercise) and time as a within-subject fixed-effects factor with three levels (baseline, 8 weeks, and 16 weeks).

Results

Out of 203 screened, 80 subjects satisfying selection criteria were randomized into two groups: yoga (n = 40) and physical exercise (n = 40). Seventy-seven participants (39 in the yoga group [mean age = 43.74 ± 7.26] and 38 in the physical exercise group [mean age = 41.47 ± 9.53]) completed the study. The reasons for dropouts are presented in the trial profile [Figure 1]. There was no difference in demographic variables between the yoga and physical exercise groups. Table 2 provides the demographic details of the subjects.

Depression Anxiety Stress Scale-21

In the yoga group, the mean stress score reduced by 59.84% (P < 0.001) in 8 weeks and by 98.13% in 16 weeks (P < 0.001), whereas, in the physical exercise group, the score reduced by 24.39% (P < 0.001) in 8 weeks and by 37.44% (P < 0.001) in 16 weeks. The mean anxiety score reduced by 63.67% (P < 0.001) in 8 weeks and by 98.12% (P < 0.001) in 16 weeks in the yoga group, whereas

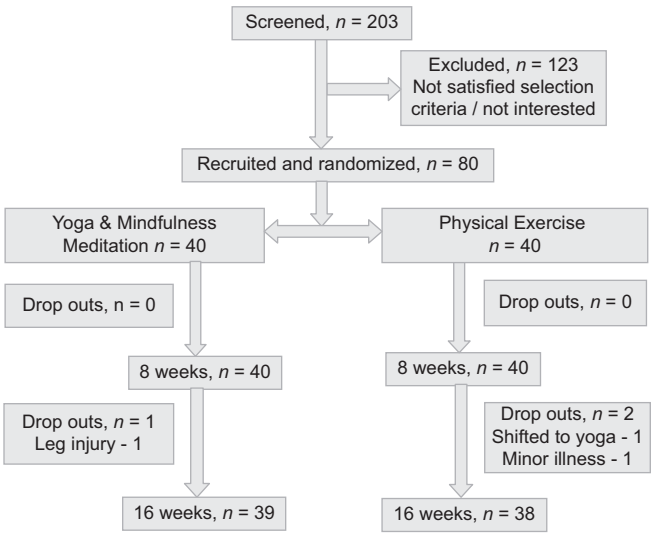

Figure 1: Trial profile

Table 1: List of Practices in Yoga & Mindfulness Meditation Group and Physical Exercise Group

Yoga and Mindfulness Meditation Group	Duration	Physical Exercise Group	Duration
Opening prayer		Supine Practice	
Anäpänasati (Mindfulness of breathing)	10 minutes	Pelvic tilt	4 minutes
Supine Practice		Quadriceps leg raises	4 minutes
Üttänapädäsana (Straight leg pose)	4 minutes	Hook lying march	4 minutes
Setubandhäsana breathing (Bridge pose lumbar stretch)	4 minutes	Bridging	4 minutes
Pavanamuktäsana (Wind releasing pose)	4 minutes	Single knee to chest	4 minutes
Prone Practice		Double knee to chest	4 minutes
Bhujaìagäsana (Serpent pose)	4 minutes	Partial curl	4 minutes
Salabhäsana (Locust pose)	4 minutes	Curl up	4 minutes
Sitting Practice		Prone Practice	
Vyäghräsana (Tiger breathing)	4 minutes	Extension exercise	4 minutes
Standing Practice		Press up	4 minutes
Ardha cakräsana (Half wheel posture)	4 minutes	Sitting Practice	
Ardhakaöi cakräsana (Lateral arc pose)	4 minutes	Cat & Camel	4 minutes
Supine Practice		Standing Practice	
Supta Üdaräakarñana (Folded leg lumbar stretch)	4 minutes	Standing hamstring stretch	4 minutes
Parivåtta Udaräakarñana (Crossed leg lumbar stretch)	4 minutes	Supine Practice	
Anäpänasati (Mindfulness of breathing in supine position)	10 minutes	Piriformis stretch	4 minutes
Closing prayer	1	Lumbar rotation	4 minutes
		Trunk rotation	4 minutes

Table 2: Demographic and clinical details of the subjects

Variables	YM (*n*=39)	PE (*n*=38)	*P*
Age (mean±SD)	43.74±7.26	41.47±9.53	0.243
Gender			
Male	24	25	0.698
Female	15	13	
Education			
Undergraduate	2	3	0.564
Graduate	17	20	
Postgraduate	20	15	
CLBP duration (years)			
>5	20	17	0.795
5-10	17	18	
<10	2	3	
Causes			
LS	14	9	0.557
PID	6	10	
LS with PID	11	11	
Muscle spasm	8	8	
Comorbidities			
Hypertension	4	3	0.810
Diabetes mellitus	2	1	
Neck pain	4	5	
Shoulder pain	1	0	
BMI (mean±SD)	27.77±3.67	27.34±2.91	0.573

LS: Lumbar spondylosis, PID: Prolapse intervertebral disc, BMI: Body mass index, SD: Standard deviation, CLBP: Chronic low back pain, YM: Yoga and mindfulness meditation, PE: Physical exercise

the score did not change significantly within the physical exercise group. Similarly, within the yoga group, the mean depression score reduced by 62.47% ($P < 0.001$) in 8 weeks and by 96.85% ($P < 0.001$) in 16 weeks, whereas the score did not change significantly in the physical exercise group. Table 3 provides the details of within-group comparisons.

Between-group analyses demonstrated that there was a significant group * time interaction effect for depression, anxiety, and stress scores at 8 weeks as well as at 16 weeks favoring the yoga group. Stress ($P < 0.001$), anxiety ($P = 0.001$), and depression ($P < 0.001$) scores were significantly lower in the yoga group as compared to the physical exercise group at the end of 8 weeks. Similarly, the stress ($P < 0.001$), anxiety ($P < 0.001$), and depression ($P < 0.001$) scores were significantly lower in the yoga group as compared to the physical exercise group at the end of 16 weeks. Table 4 provides the details of between-group comparisons.

Spinal mobility using a dial-type goniometer

Within-group analyses revealed that there was a significant improvement in SF, SE, RLF, and LLF scores in 8 weeks as well as in 16 weeks in both the yoga group and the physical exercise group ($P < 0.001$). In the yoga group, the mean SF score increased by 50.18% in 8 weeks and by 94.33% in 16 weeks, whereas, in the physical exercise group, the score increased by 37.90% in 8 weeks and by 74.55% in 16 weeks. Similarly, the mean SE increased by 75.24% in 8 weeks and by 142.73% in 16 weeks in the yoga group, whereas, in the physical exercise group, the SE score increased by 56.45% in 8 weeks and by 106.49% in 16 weeks. In the yoga group, the mean RLF score increased by 44.05% in 8 weeks and by 88.33% in 16 weeks, whereas, in the physical exercise group, the score increased by 37.27% in 8 weeks and by 74.04% in

Table 3: Within-group analyses for stress, anxiety, depression, spinal flexion, spinal extension, right lateral flexion, and left lateral flexion

Variables	Mean±SD			Baseline versus 8 weeks		Baseline versus 16 weeks		*F*
	Baseline (1)	8 weeks (2)	16 weeks (3)	Percentage change	*P*[a]	Percentage change	*P*[a]	
Stress								
YM	11.23±4.62	4.51±2.86	0.21±0.76	59.84	<0.001***	98.13	<0.001***	235.31 (2, 74)
PE	11.11±1.96	8.84±2.06	6.95±1.95	24.39	<0.001***	37.44	<0.001***	31.90 (2, 74)
Anxiety								
YM	2.67±3.22	0.97±1.29	0.05±0.32	63.67	<0.001***	98.12	<0.001***	28.19 (2, 74)
PE	2.26±1.81	2.16±1.82	1.95±1.64	4.42	1.000	13.72	1.000	0.91 (2, 74)
Depression								
YM	4.77±5.14	1.79±2.33	0.15±0.54	62.47	<0.001***	96.85	<0.001***	32.47 (2, 74)
PE	4.63±1.48	4.00±1.47	3.79±1.45	13.61	0.393	18.14	0.447	1.16 (2, 74)
SF								
YM	40.77±19.18	61.23±13.96	79.23±7.68	50.18	<0.001***	94.33	<0.001***	203.28 (2, 74)
PE	38.55±16.88	53.16±14.44	67.29±10.09	37.90	<0.001***	74.55	<0.001***	107.94 (2, 74)
SE								
YM	13.05±5.44	22.87±5.50	31.69±4.40	75.24	<0.001***	142.83	<0.001***	664.18 (2, 74)
PE	12.63±4.66	19.76±5.05	26.08±4.76	56.45	<0.001***	106.49	<0.001***	328.22 (2, 74)
RLF								
YM	13.03±4.65	18.77±4.46	24.54±3.81	44.05	<0.001***	88.33	<0.001***	731.20 (2, 74)
PE	12.29±4.07	16.87±4.17	21.39±3.97	37.27	<0.001***	74.04	<0.001***	444.94 (2, 74)
LLF								
YM	12.77±4.16	18.56±4.01	24.64±3.59	45.34	<0.001***	92.95	<0.001***	915.94 (2, 74)
PE	13.08±4.46	17.61±4.55	22.13±4.34	34.63	<0.001***	69.19	<0.001***	515.67 (2, 74)

***P<0.001, [a]Repeated measures ANOVA. YM: Yoga and mindfulness meditation, PE: Physical exercise, SF: Spinal flexion, SE: Spinal extension, RLF: Right lateral flexion, LLF: Left lateral flexion, SD: Standard deviation

16 weeks. Similarly, the mean LLF score increased by 45.34% in 8 weeks and by 92.95% in 16 weeks in the yoga group, whereas, in the physical exercise group, the LLF score increased by 34.63% in 8 weeks and by 69.19% in 16 weeks. Table 3 provides the details of within-group comparisons.

Between-group analyses demonstrated a significant group * time interaction effect for SF, SE, RLF, and LLF at 16 weeks favoring the yoga group. SF score (P = 0.015) and SE score (P = 0.012) were significantly higher in the yoga group as compared to the physical exercise group at the end of 8 weeks, whereas the SF (P < 0.001), SE (P < 0.001), RLF (P = 0.001), and LLF (P = 0.007) scores were significantly higher in the yoga group as compared to the physical exercise group at the end of 16 weeks. Table 4 provides the details of between-group comparisons.

Discussion

In the current study, there was a significant group * time interaction effect for stress, anxiety, and depression scores favoring the yoga group at 8 weeks as well as at 16 weeks favoring the yoga group. The stress scores were reduced by 98.13% in 16 weeks with a significant difference between the groups favoring the yoga group in the current study. In one recent study, the stress scores had reduced by 28.21% after 4-week hatha yoga sessions.[32] In our study, the mean anxiety score was also reduced by 98.12% in 16 weeks in the yoga group with a significant difference between the groups favoring the yoga group. The mean anxiety score did not change significantly within the physical exercise group. Similarly, the mean depression score reduced significantly by 96.85% in 16 weeks within the yoga group with a significant difference between the groups favoring the yoga group, whereas the score did not change significantly within the physical exercise group. In an earlier similar study, the mean anxiety score and depression score reduced significantly by 20.4% and 46.99%, respectively, in the yoga group after a 1-week residential yoga program comprising *asanas*, *pranayamas,* and meditation with significant differences between groups favoring the yoga group.[33] The results of the current study are in line with the earlier study. The greater reduction in our study may be because of the longer duration of intervention and the additional practice of mindfulness of breathing (for 20 min) as mindfulness practices are associated with enhancements in emotion regulation and positive mood.[34]

Further, in our study, there was a significant improvement in SF, SE, RLF, and LLF scores within both the yoga group and the physical exercise group, however, a significant group * time interaction effect was observed at 8 weeks as

Table 4: Between-group analyses for stress, anxiety, depression, spinal flexion, spinal extension, right lateral flexion, and left lateral flexion

Variables	Baseline			8 weeks			16 weeks		
	Mean±SD	*F*	*P*[a]	Mean±SD	*F*	*P*[a]	Mean±SD	*F*	*P*[a]
Stress									
YM	11.23±4.62	0.02 (1, 75)	0.878	4.51±2.86	57.96 (1, 75)	<0.001***	0.21±0.76	399.49 (1, 75)	<0.001***
PE	11.11±1.96			8.84±2.06			6.95±1.95		
Anxiety									
YM	2.67±3.22	0.45 (1, 75)	0.502	0.97±1.29	10.87 (1, 75)	0.001**	0.05±0.32	50.00 (1, 75)	<0.001***
PE	2.26±1.81			2.16±1.82			1.95±1.64		
Depression									
YM	4.77±5.14	0.02 (1, 75)	0.874	1.79±2.33	24.51 (1, 75)	<0.001***	0.15±0.54	213.44 (1, 75)	<0.001***
PE	4.63±1.48			4.00±1.47			3.79±1.45		
SF									
YM	40.77±19.18	0.29 (1, 75)	0.592	61.23±13.96	6.22 (1, 75)	0.015*	79.23±7.68	34.27 (1, 75)	<0.001***
PE	38.55±16.88			53.16±14.44			67.29±10.09		
SE									
YM	13.05±5.44	0.13 (1, 75)	0.718	22.87±5.50	6.66 (1, 75)	0.012*	31.69±4.40	28.95 (1, 75)	<0.001***
PE	12.63±4.66			19.76±5.05			26.08±4.76		
RLF									
YM	13.03±4.65	0.54 (1, 75)	0.463	18.77±4.46	3.72 (1, 75)	0.057	24.54±3.81	12.57 (1, 75)	0.001**
PE	12.29±4.07			16.87±4.17			21.39±3.97		
LLF									
YM	12.77±4.16	0.10 (1, 75)	0.753	18.56±4.01	0.96 (1, 75)	0.330	24.64±3.59	7.66 (1, 75)	0.007*
PE	13.08±4.46			17.61±4.55			22.13±4.34		

*P<0.05, **P<0.01, ***P<0.001, [a]Repeated measures ANOVA with Bonferroni's correction. YM: Yoga and mindfulness meditation, PE: Physical exercise, SF: Spinal flexion, SE: Spinal extension, RLF: Right lateral flexion, LLF: Left lateral flexion, SD: Standard deviation

well as at 16 weeks favoring the yoga group as compared to the physical exercise group. The SF score improved by 94.33% within the yoga group in 16 weeks, whereas the score improved by 74.55% within the physical exercise group. Similarly, the SE score improved by 142.73% within the yoga group in 16 weeks, whereas the score improved by 106.49% in the physical exercise group. In an earlier similar study, the SF score improved by 28.30% within the yoga group after a 1-week residential yoga program, and the score improved by 15.91% within the physical exercise group after a 1-week physical exercise program.[24] Similarly, in the earlier study, the SE score improved by 51.52% within the yoga group and the score improved by 22.14% in the exercise group after 1 week of intervention.[24] The longer duration of physical exercise may be the reason for the significant improvement in the physical exercise group too in the current study. However, significantly greater improvement in the yoga group was observed as compared to the physical exercise group in both studies.

In the current study, the RLF score improved by 88.33% within the yoga group in 16 weeks, whereas the score improved by 74.04% in the physical exercise group. Similarly, the LLF score improved by 92.95% within the yoga group in 16 weeks, whereas the score reduced by 69.19% in the physical exercise group. In the earlier similar study, the RLF score improved by 26.36% within the yoga group after a 1-week residential yoga program, and the score improved by 13.9% within the physical exercise group after a 1-week physical exercise program.[24] Similarly, in the earlier study, the LLF score improved by 39.15% within the yoga group and the score improved by 17.13% in the exercise group after 1 week of intervention.[24] In both the studies, the greater improvements in the yoga group show the greater effectiveness of yogic practices over physical exercise, whereas greater improvement within both the groups in our study compared to the earlier study[24] indicates the benefit of a longer duration of intervention.

Possible mechanisms through which yoga therapy may work in CLBP include downregulation of the hypothalamic–pituitary–adrenal (HPA) axis and bringing a state of parasympathetic nervous system dominance.[35] The components such as mindfulness and relaxation may be the major contributors to the downregulation of sympathetic nervous system (SNS) and HPA. Health benefits related to mindfulness are associated with enhancements in emotion regulation and positive mood.[34] Breath regulation, on the other hand, has the potential to bring the mind to a state of mindfulness and reduce the level of stress.[36] Yogic postures improve muscular strength and flexibility and promote respiratory and cardiovascular functions[37] which ultimately assist in better musculoskeletal health. Meditation and relaxation techniques after practicing yoga postures help to relax joints and muscles. However, the

physical and mechanical aspects of the yogic postures are quite similar to physical exercises which may be the reason that the physical exercises also demonstrated similar kinds of improvements. Physical exercise is also considered to be a widely accepted method for improving and maintaining holistic health.[35] However, yoga appeared to be more effective than physical exercise in CLBP which may be because of various aspects of yoga other than the physical one. Hence, maintaining the postures, breath regulation, mindfulness, and relaxation are the major components that separated yoga from exercises.[20]

Conclusion

Yoga and physical exercise both demonstrated beneficial effects in computer users with chronic LBP. However, yoga appeared to be more effective in reducing stress, anxiety, and depression and in improving spinal mobility in computer users with CLBP as compared to physical exercise. The strengths of the current study are robust methodology, use of standardized and validated assessment tools, and intervention protocols.

However, the study is limited to nonsupervised sessions for the last 8 weeks and possible confounding effects of the COVID-19 pandemic. In future, a multicentric study with longer follow-up can be conducted to confirm the results of the present study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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