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Original Research Article

Effects of Yogic Practices on Various Physiological Parameters

Joshna Rani Malla[1], Deepti Konala[2], Rada Padmaja[3], Ankem Amar Sandeep[4], M. Padma Geethanjali[5]

[1, 3, 4]Assistant Professor, Department of Physiology, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India

[2]Assistant Professor, Department of Biochemistry, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India

[5]Professor and HOD, Department of Physiology, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India

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Corresponding Author: Dr Joshna Rani Malla

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Abstract:

Background: Yoga is a mind–body practice that combines postures, breathing exercises, relaxation and meditation. It may influence cardiovascular, metabolic, anthropometric and cognitive functions through autonomic regulation and stress reduction.

Aim: To evaluate the effect of three months of regular yogic practice on selected physiological parameters among healthy volunteers.

Methods: This interventional study was conducted among 40 healthy volunteers at Yoga Village, Andhra University, from June 2017 to June 2018. Participants aged 20–60 years, of either gender, who were apparently healthy and willing to participate were included. Subjects practiced yoga for 75 minutes per day, six days per week, for three months. Parameters such as weight, body mass index, waist–hip ratio, pulse rate, systolic blood pressure, diastolic blood pressure, fasting blood sugar and visual reaction time were recorded before and after the intervention. Data were analysed using paired t-test.

Results: After three months of yoga practice, significant reductions were observed in pulse rate, systolic blood pressure, diastolic blood pressure, weight, body mass index, fasting blood sugar and visual reaction time. Waist–hip ratio did not show significant change.

Conclusion: Regular yogic practice for three months improved cardiovascular, metabolic, anthropometric and cognitive parameters among healthy volunteers.

Keywords: Yoga; Physiological Parameters; Blood Pressure; Fasting Blood Sugar; Visual Reaction Time.

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Introduction

Yoga is an ancient Indian mind–body discipline that integrates postures, regulated breathing, cleansing practices, mudras, bandhas, relaxation and meditation to promote harmony between physical, mental and autonomic functions. Unlike many conventional exercise schedules, yoga is less equipment-dependent, relatively low-cost and can be practiced within a short daily time, making it suitable for healthy individuals as a preventive lifestyle intervention [1]. Recent evidence suggests that yoga may improve cardiovascular regulation, reduce systolic and diastolic blood pressure (DBP), lower heart rate, improve autonomic balance and positively influence metabolic risk factors such as body mass index (BMI), waist circumference and blood glucose levels [2, 3]. These effects are thought to occur through reduced sympathetic activity, enhanced vagal tone, stress reduction, improved respiratory efficiency and better self-regulation of lifestyle behaviour. Yoga-based practices may also influence cognitive performance by improving attention, concentration and psychomotor speed. However, although long-term yoga practice has been widely studied, the physiological effects of short-term structured yoga practice still require further evaluation [4]. Therefore, the present study was undertaken to assess the effects of regular yogic practices for three months on selected physiological parameters among healthy volunteers, including weight, BMI, waist–hip ratio, fasting blood sugar, pulse rate (PR), systolic and DBP, and cognitive function assessed by visual reaction time.

Methods

This interventional study was designed to evaluate the effect of short-term yogic practices on selected physiological parameters, including weight, BMI, waist–hip ratio, PR, systolic blood pressure (SBP), DBP, fasting blood sugar (FBS) and cognitive function assessed by visual reaction time. The study was conducted among 40 healthy volunteers at Yoga Village, Andhra University, which functions as a major training centre for individuals seeking structured yoga practice. The study was carried out over a period of one year, from June 2017 to June 2018, after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all volunteers before enrolment. Participants of either gender, aged between 20 and 60 years, who were apparently healthy on physical and clinical examination and willing to participate were included. Volunteers were required to attend at least 85% yoga sessions and practice yoga for a minimum of 75 minutes per day, six days per week, for a minimum duration of three months. Subjects who were unwilling to provide valid consent, those with a history of pre-existing hypertension, diabetes mellitus, neurological disorders, hepatic impairment or renal impairment, pregnant and lactating women, and individuals with tobacco, alcohol or substance abuse were excluded from the study.

Baseline physiological parameters were recorded before initiation of yoga training and the same parameters were reassessed after three months of regular yoga practice. Before recording the parameters, participants were instructed to avoid intensive exercise and to refrain from consuming hot or cold beverages for at least 30 minutes. The procedures were explained and demonstrated to the participants before assessment. Anthropometric measurements included height, weight, BMI and waist–hip ratio. Height was measured using a wall-mounted stadiometer and weight was measured using a digital weighing machine. BMI was calculated from height and weight measurements using the standard formula. Waist circumference was measured using a measuring tape at the level of the umbilicus at the end of normal expiration, while hip circumference was measured at the widest part of the buttocks; waist–hip ratio was then calculated. For basal cardiovascular parameters, participants were made to lie down comfortably in the supine position on a couch. After 10 minutes of rest, PR, SBP and DBP were recorded using a digital blood pressure monitor. Cognitive function was assessed by measuring visual reaction time using online software. Fasting blood sugar was estimated using standard biochemical analysis.

The structured yoga intervention was continued for three months and included a combination of prayer, asanas, pranayama, kriyas, mudras, bandhas, relaxation techniques and meditation. Each daily session lasted approximately 75 minutes and consisted of prayer, 35–45 minutes of asanas and pranayama, 10 minutes of traditional audio-guided meditation and 10 minutes of Savasana. The asanas practiced included Trikonasana, Parsvottanasana, Urdhva Mukha Svanasana, Adho Mukha Svanasana, Chaturanga Dandasana, Veerasana, Supta Veerasana, Mahamudrasana, Parvatasana, Upavishta Konasana, Poorvottanasana, Halasana, Matsyasana, Bhujangasana, Salabhasana, Dhanurasana, Ustrasana, Sasankasana, Sarvangasana and other variations, depending on the session plan. Pranayama practices included Nadisuddhi, Suryabhedana, Ujjayi, Sitali, Sitkari, Bhastrika, Bhramari and Anulom–Vilom. Adherence to the yoga programme and correct performance of postures were monitored throughout the study. Participants were encouraged to stretch within comfortable limits, maintain awareness of breathing and relax adequately between practices. Care was taken to prevent discomfort or injury during the sessions. Data were expressed as mean ± standard deviation. Pre- and post-intervention values of physiological parameters were compared using Student's paired t-test.

Results

The present interventional study included 40 healthy volunteers who underwent regular yogic practices for three months. Among the participants, females constituted 21 cases (52.5%) and males constituted 19 cases (47.5%). The majority of volunteers were below 30 years of age, accounting for 23 participants (57.5%), followed by 9 participants (22.5%) in the 31–40-year age group, 3 participants (7.5%) in the 41–50-year age group and 5 participants (12.5%) in the 51–60-year age group (Table 1). After three months of yoga practice, a statistically significant reduction was observed in cardiovascular parameters. Mean pulse rate decreased from 77.13 ± 7.917 to 74.05 ± 8.184 beats/min, SBP decreased from 120.68 ± 8.547 to 117.28 ± 7.809 mmHg, and diastolic blood pressure decreased from 81.20 ± 5.090 to 79.00 ± 4.956 mmHg, all with p=0.001 (Table 2). Anthropometric parameters also showed improvement, with mean weight decreasing from 66.88 ± 13.259 kg to 64.888 ± 12.9849 kg and mean BMI decreasing from 26.255 ± 4.6299 to 25.515 ± 4.4938 kg/m^2; both changes were statistically significant. However, waist–hip ratio did not show a significant change after yoga practice (p=0.426) (Table 3). Fasting blood sugar showed a significant reduction from 83.85 ± 6.765 mg/dL to 76.90 ± 7.445 mg/dL. Cognitive function, assessed by visual reaction time, also improved significantly, with mean reaction time decreasing from 269.95 ± 25.383 ms to 231.55 ± 13.866 ms (Table 4). Overall, three months of regular yoga practice produced favourable effects on cardiovascular, metabolic, anthropometric and cognitive parameters.

Table 1: Demographic distribution of study participants			
Variable	**Category**	**Frequency**	**%**
Age group	<30	23	57.5
	31–40	9	22.5
	41–50	3	7.5
	51–60	5	12.5
Gender	Female	21	52.5
	Male	19	47.5
Total		40	100

Table 2: Effect of yoga on cardiovascular parameters in Mean ± SD				
Parameter	**Before yoga**	**After yoga**	**t-value**	**p-value**
PR, beats/min	77.13 ± 7.917	74.05 ± 8.184	12.476	0.001*
SBP, mmHg	120.68 ± 8.547	117.28 ± 7.809	9.146	0.001*
DBP, mmHg	81.20 ± 5.090	79.00 ± 4.956	4.956	0.001*

Table 3: Effect of yoga on anthropometric parameters in Mean ± SD				
Parameter	**Before yoga**	**After yoga**	**t-value**	**p-value**
Weight, kg	66.88 ± 13.259	64.888 ± 12.9849	7.763	0.001*
BMI, kg/m²	26.255 ± 4.6299	25.515 ± 4.4938	6.221	0.001*
Waist–hip ratio	0.8578 ± 0.06837	0.8578 ± 0.06319	-0.804	0.426

Table 4: Effect of yoga on fasting blood sugar and cognitive function in Mean ± SD				
Parameter	**Before yoga**	**After yoga**	**t-value**	**p-value**
FBS, mg/dL	83.85 ± 6.765	76.90 ± 7.445	14.675	0.001*
Visual reaction time, ms	269.95 ± 25.383	231.55 ± 13.866	11.473	0.001*

Discussion

The present study demonstrated that three months of regular yogic practice produced favourable changes in several physiological parameters among healthy volunteers. Significant reductions were observed in pulse rate, SBP, DBP, weight, BMI, FBS and visual reaction time, while waist–hip ratio did not show a statistically significant change. These findings support the concept that yoga acts as a practical mind–body intervention with measurable benefits on cardiovascular, metabolic, anthropometric and cognitive functions even within a short duration. The reduction in resting pulse rate and blood pressure may be attributed to improved autonomic regulation, reduced sympathetic tone and enhanced parasympathetic activity. Recent Indian evidence also supports the role of yoga in improving blood pressure, heart rate variability and cardiovascular fitness in both healthy and hypertensive individuals [5, 6]. The findings of the present study are clinically relevant because even modest reductions in resting heart rate and blood pressure may indicate improved cardiovascular efficiency and reduced physiological stress load.

The significant decrease in pulse rate after yoga practice in the present study reflects better cardiac autonomic balance. Yoga practices such as asanas, pranayama, meditation and relaxation are known to influence the autonomic nervous system through slow breathing, vagal stimulation, baroreflex modulation and reduction of hypothalamic–pituitary–adrenal axis activity. Krishna et al. reported that yoga therapy significantly decreased heart rate and blood pressure and improved cardiac autonomic function in patients with heart failure, indicating increased parasympathetic and reduced sympathetic activity [7]. Similarly, Amadawala et al. observed improvement in Ewing's battery autonomic function tests after yoga, suggesting that yoga has a favourable effect on autonomic reactivity [8]. In the present study, the fall in pulse rate from 77.13 to 74.05 beats/min may appear small, but it was statistically significant and indicates a shift towards a more relaxed basal physiological state. Such change is important because resting tachycardia and sympathetic predominance are associated with stress, poor cardiometabolic health and increased cardiovascular risk.

The reduction in systolic and diastolic blood pressure observed in this study is consistent with earlier Indian studies on yoga and hypertension. Kothari et al. reported significant improvements in blood pressure, BMI and aerobic capacity following yoga practice in hypertensive subjects, while Shetty et al. found that a yoga and naturopathy-based lifestyle intervention helped in controlling mild elevations of blood pressure [9, 10]. Ahuja et al., in a systematic review and meta-analysis, concluded that Yoga Nidra was effective in reducing both systolic and DBP, particularly among hypertensive

individuals [11]. The mechanism may involve decreased peripheral vascular resistance, improved endothelial function, reduced catecholamine levels, reduced anxiety and improved sleep. In the current study, participants were healthy volunteers rather than hypertensive patients; therefore, the reduction in blood pressure suggests a preventive physiological benefit rather than only a therapeutic effect. This supports yoga as a useful lifestyle measure for maintaining cardiovascular health.

The significant reduction in body weight and BMI after three months of yoga practice indicates that yoga may contribute to favourable anthropometric changes even when practiced for a relatively short period. The mean weight decreased from 66.88 kg to 64.888 kg, and BMI decreased from 26.255 kg/m² to 25.515 kg/m². Similar improvements in anthropometric measures have been reported by Anuradha et al., who observed that yoga improved blood pressure, lipid profile and anthropometric parameters among patients with type 2 diabetes mellitus [12]. Annamalai et al. also reported that yogic cleansing practice helped reduce body weight, BMI, waist circumference and hip circumference [13]. In the present study, waist–hip ratio did not change significantly, which may be due to the relatively short duration of intervention, modest sample size and the fact that regional fat redistribution usually requires longer-term lifestyle modification. Nevertheless, the reduction in weight and BMI indicates improvement in overall body composition and energy balance. Yoga may influence weight through increased physical activity, improved dietary awareness, better sleep, reduced stress-eating and improved hormonal regulation.

The significant fall in FBS after yoga practice is an important finding of the present study. Although the volunteers were apparently healthy, fasting blood sugar decreased from 83.85 mg/dL to 76.90 mg/dL, suggesting better glucose homeostasis. Indian studies among diabetic and high-risk populations have shown that yoga improves glycaemic control, lipid parameters, oxidative stress markers and inflammatory profile. Viswanathan et al., in the SATYAM project from South India, reported that yoga improved glycaemic control, oxidative stress, inflammatory markers and sleep quality among subjects with type 2 diabetes [14]. Misra et al. showed that a community-based structured yoga programme improved HbA1c and lipid profile among type 2 diabetes patients [15]. Dutta et al., in a meta-analysis, concluded that yoga improves glycaemia and lipid parameters in type 2 diabetes [16]. Raghuram et al. also reported that a yoga-based lifestyle protocol was effective in halting progression to diabetes among high-risk individuals [17]. These findings support the metabolic effect observed in the present study. Possible mechanisms include increased skeletal muscle glucose uptake, improved insulin sensitivity, reduction in cortisol and better autonomic regulation of pancreatic and hepatic metabolism.

Cognitive function, assessed by visual reaction time, improved significantly after yoga practice in the present study. Visual reaction time decreased from 269.95 ms to 231.55 ms, indicating improved psychomotor speed, alertness and sensory-motor coordination. This observation agrees with Indian evidence showing that yoga improves cognition and autonomic balance among young adults and medical students. Mishra et al. reported that six weeks of supervised yoga improved heart rate variability, sleep quality and cognitive performance among medical students, suggesting that yoga-mediated autonomic improvement may contribute to better cognitive functioning (14). The cognitive benefit of yoga may be due to improved attention, reduced mental fatigue, better sleep, reduced anxiety, improved cerebral perfusion and enhanced prefrontal cortical regulation. Overall, the present findings suggest that three months of regular yoga practice can produce measurable benefits across multiple physiological domains. However, the study was limited by small sample size, absence of a control group and short follow-up. Future randomized controlled studies with larger samples, dietary monitoring, detailed autonomic testing and long-term follow-up are needed to confirm these findings.

Conclusion

The present interventional study showed that three months of regular yogic practice produced significant beneficial effects on selected physiological parameters among healthy volunteers. There was a significant reduction in pulse rate, SBP, DBP, body weight, body mass index, fasting blood sugar and visual reaction time after the yoga intervention. These findings suggest that short-term structured yoga practice may improve cardiovascular efficiency, metabolic status, body composition and cognitive performance. However, waist–hip ratio did not show a significant change, indicating that regional fat distribution may require a longer duration of intervention. The study had certain limitations. The sample size was small, and the study was conducted without a separate control group. Dietary intake, sleep pattern and daily physical activity were not strictly monitored. Long-term follow-up was not performed. Hence, larger randomized controlled studies with longer follow-up are required to confirm these findings.

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