Journal of Exercise Physiologyonline

August 2022
Volume 25 Number 4

Official Research Journal of the American Society of Exercise Physiologists

ISSN 1097-9751

JEPonline

Effects of Vinyasa Yoga on Stress and Health Benefits in Office Workers

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ABSTRACT

Sinpichetkorn T, Chaunchaiyakul R, Yang AL, Lin YY, Masodsai K. Effects of Vinyasa Yoga on Stress and Health Benefits in Office Workers. **JEPonline** 2022;25(4):53-63. The purpose of this study was to determine the effects of Vinyasa Yoga on stress and health benefits in office workers. Thirty sedentary subjects with low to moderate stress scores, aged 18 to 35 years, voluntarily participated and were randomly divided into the Control Group (n = 15) and the Vinyasa Yoga Group (n = 15) Groups. The Vinyasa Yoga Group was regularly trained for 1 $hr \cdot d^{-1}$, 3 $d \cdot wk^{-1}$ for 8 weeks. Subjects in both Groups were asked to refrain from any activities and remedial treatments that may affect the stress level during the 8-week period. The stress level and saliva cortisol concentrations, heart rate variability (HRV), and physical fitness were monitored at baseline (initial, wk0) and after 8 weeks (wk8). The findings indicate that the Vinyasa Yoga Group showed higher handgrip and back strength, push-up, wall sit, sit and reach, and back scratch levels ($P<0.05$) on wk8 compared to the wk0. However, these changes were not shown in the Control Group. Within-group as well as between-group comparisons showed no differences in HRV and saliva cortisol at wk0 and wk8. It was concluded that the Vinyasa Yoga resulted in significant positive health impacts on limb muscle strength and flexibility without any negative effects on cardiac function.

Key Words: Office Workers, Physical Fitness, Stress, Vinyasa Yoga

INTRODUCTION

Stress typically has negative impacts on physical and/or psychological issues. It causes changes in cardiorespiratory and neuromuscular functions and mood status by way of the hypothalamus of the central nervous system that activates endocrine and sympathetic nervous system responses, which gradually trigger a series of physiological reactions such as an increase in cardiac output, blood pressure, and blood sugar that is released by the liver to nourish the muscles while suppressing the immune system (28). Office workers, in particular, increase stress exponentially due to their high workload that contributes to exhaustion and unhealthy behaviors, including sleeplessness, lack of a proper exercise, and the increased tendency to be an alcoholic and smoke more frequently. Moreover, it is clear that people who have a high-stress level may lack stress management skills. More often than not, these unhealthy habits can produce a high level of stress and a decrease in fitness (4).

Heart rate variability (HRV) is a common physiological cardiac indicator that is used to monitor the autonomic nervous system (26). HRV is a physiological phenomenon in which the time interval between heartbeats varies is measured by the variation in the beat-to-beat interval. The analysis of HRV can be grouped under time and frequency domains. The advantages of frequency domain spectral analysis are derived from the sensitivity, accuracy, and quantitative outcomes that allow for the understanding of short-term steady states and the measurement of physiological changes of the sympathetic and parasympathetic nervous systems. In addition, the above symptoms of stress activation result in a decrease in heart rate variability (HRV) with an increase in sympathetic nervous system and a decrease in parasympathetic nervous system, which leads to a decrease in the ability to work, to sleep, physical fitness, and quality of life (9).

A known chronic stress hormone is an individual’s cortisol level (22). It occurs at or during the same time with the working of the hypothalamus-pituitary-adrenal (HPA) axis, which is involved in mood/stress disorders and functional illnesses (such as anxiety, insomnia, and bipolar disorders). The organ system’s response to stress is by way of stimulating the HPA axis to produce catecholamines (i.e., hormones such as adrenaline) at the adrenal glands (16,22) to increase blood flow to the muscles, heart, and lungs. However, the long-term activation of the stress response system can disrupt the body's processes that lead to the decrease in physical fitness, mental health, and emotion. All of these are strongly related to stress (1,8). To avoid increasing the risk of health problems, it is necessary to prevent and deal with the stressors via different methods such as exercise, recreation, meditation, and yoga.

Yoga has been researched for its effectiveness in helping to reduce psychological stress. It is a form of mind-body therapy for a variety of clinical conditions, such as eating disorders, hypertension, and pain. Vinyasa Yoga is a kind of Hatha Yoga that is notable in attention to the synchronization of the posture while doing a breath technic slowly constantly, and smoothly while also increasing concentration and meditation, which leads to a decrease in stress. (22) However, there are a limited number of studies confirming the effectiveness of Vinyasa Yoga on health benefits and stress. Thus, the purpose of this study was to determine the effects of 8 weeks of Vinyasa Yoga training on stress levels and stress hormone concentrations, cardiac functions, and physical fitness in office workers (12).

METHODS

Subjects

Thirty healthy office workers 18 to 35 years of age with low to moderate stress scale scored of ≤26 via a perceived stress scale (12,13,17) voluntarily participated in this study. This study assumed that there is no gender difference among the subjects. Those who are with a central nervous system problem, musculoskeletal system disease, pregnancy, using any supplement or medicine that affects stress, exercising or joining a yoga class more than 30 min·time^{-1} more than 3 times·wk^{-1}, or doing meditation during the previous 8 weeks, consuming alcohol and/or tobacco regularly, having a history of a serious incidence that severely affected one's mentality were excluded. All participants completed the written informed consent forms prior to participation. This study was approved by the Institution Research Board of Chulalongkorn University (COA No. 059/65).

Procedures

All the participants were instructed: (a) to avoid coffee, tea, tobacco, alcohol, vigorous and/or unfamiliar strenuous physical activity; and (b) to maintain their regular diet and sleep more than 8 hours on the day prior to the test. On the testing day, the participants visited the laboratory at 7:30 AM where they were asked to rest for 5 to 10 minutes in a relaxed position before measuring the baseline variables that consisted of blood pressure and resting heart rate. HRV was assessed using Polar H10 Heart Rate Sensor Northern Finland. Participants were asked to sit quietly for the 5 min of measurements. Afterward, saliva cortisol was collected using Sarstedt Salivette Cotton Swab for Saliva Collection at 8:00 AM.

Physical fitness was evaluated, which included body composition (using a body composition analyzer IOI 353 Korea), muscle flexibility (via the Sit and Reach Test, which was followed by the Back Scratch Test), muscle strength (via the Handgrip Strength Test, which was followed by the Back and Leg Strength Test), muscle endurance (via push up, and the wall sit), cardiorespiratory endurance (via the 6-Minute Walk Test; 6MWT). All the variables were collected at baseline and after 8 weeks of Vinyasa Yoga training. Participants recorded the topic that made them feel more or less stress than usual. The regular Vinyasa Yoga training was conducted 1 hr·time^{-1}, 3 times·wk^{-1} for 8 weeks by a certified practitioner.

Vinyasa yoga training used in this study composes of slow movement exercises of various muscles and joints (Table 1). The participants received 60 minutes of Vinyasa Yoga intervention 3 d·wk^{-1} under the supervision of a certified yoga therapist. The participants were instructed to wear loose comfortable clothing. The daily Vinyasa Yoga training intensity was controlled up to the ranges of 60 to 80% of (15,21) maximum heart rate (presenting about 68.8% to 71.7% during training) for the 8-week training period.

Table 1. List of Yoga Posts Included in the Vinyasa Yoga Training.

Section	Lists of Practice
Centering	Sukhasana – sit comfortably, soften the gaze, close eyes, and bring attention inward, undistracted by what is around. Body Scan - Spinal posture, shoulders, and trunk - how the shoulder alignment affects the arms, sit-bones, legs. Mind Scan - Label your mood and/or emotion, energy level Breath - Notice your breath, what happens to the body when you inhale and exhale.
Warm-Up	Neck Stretch side-to-side, Neck Stretch forward-back, Full Neck Circles, Shoulder Circles, Seated Spinal Twist (Parivrtta Sukhasana), Cat/Cow, Lift the right/left - arm and left/right - leg (bird dog), Wrist Therapy, Extended Child's Pose (Utthita Balasana), Downward Facing Dog (Adho Mukha Svanasana), Standing Side Stretch (Parsva Urdhva Hastasana) Surynamaskar 3 rounds
Asana	Standing Sequence 1: rescent High Lunge (Ashta Chandrasana), Warrior I (Virabhadrasana I), Warrior II (Virabhadrasana II), Reverse Warrior II, Triangle Pose (Utthita Trikonasana), Extended-Side Angle (Utthita Parsvakonasana) Surynamaskar 3 rounds Standing Sequence 2: Chair Pose (Utkatasana), Wide-Legged Forward Fold (Prasarita Padottanasana A & C), Wide-Leg fold - Twist (Parivrtta Ardha Prasarita), Side lunge (Crouching Tiger, Hidden Dragon), Stand tall (Tadasana), Tree (Vrksasana), Eagle or Eagle Prep (Garudasana) Vinyasa: Tadasana, Forward bend, High plank, Chaturanga, Upward facing dog, Downward facing dog, Step feet forward, Sit on floor with legs in front Seated Sequence: Wide Diamond, Close Diamond (Baddha Konasana), Dandasana, Vinyasa2, Seated-Forward-Bend (Paschimottanasana), Janu Sirsasana A, Marichyasana A, Wide-Leg-Bend (Upavistha Konasana), Wide-Leg-Bend Side Stretch (Parivrtta Janu Sirsasana)
Closing	Upside-Down Pigeon (Eka Pada Raj Kapotasana prep), Bridge (Setu Bandha Sarvangasana), Knee to Chest (Apanasana), Happy Baby (Ananda Balasana), Reclined Side Twists (Supta Parivartanasana) Savasana 10 min

Statistical Analysis

All the variables were presented as means and standard errors of mean (SEM). The SPSS statistical package (version 21, BMI, New York, USA) was used to analyze the data. The statistical difference was determined using the independent- and paired-*t* test with the alpha level set at P<0.05.

RESULTS

Participants in the Control Group and the Training Group worked for 2.87 ± 0.31 and 3.80 ± 0.53 years, respectively. At the beginning of the study, there were no significant differences (P>0.05) in the anthropometric and physiologic variables (Table 2). All the subjects were successful in completing the 8-week period of the study.

Table 2. General Characteristics of the Subjects in the Control Group and the Vinyasa Yoga (Training) Group during the Initial Phase (Pre-Test) of the Study.

Conditions	Control Group (n = 15)	Training Group (n = 15)
Age (yrs)	24.20 ± 0.50	25.80 ± 1.03
Weight (kg)	59.77 ± 3.94	55.85 ± 2.28
Height (cm)	166.70 ± 2.25	160.15 ± 2.16
BMI ($kg \cdot m^{-2}$)	21.23 ± 0.99	21.79 ± 3.43
Resting Heart Rate (bpm)	75.20 ± 1.82	72.80 ± 0.89
Resting SBP (mmHg)	108.27 ± 1.96	106.80 ± 2.20
Resting DBP (mmHg)	63.47 ± 1.58	61.67 ± 1.64
Perceived Stress Scale	18.80 ± 1.58	17.87 ± 1.20
Years of Work (yrs)	2.87 ± 0.31	3.80 ± 0.53

Values are mean ± SEM. **BMI** = Body Mass Index; **HR** = Heart Rate; **SBP** = Systolic Blood Pressure; **DBP** = Diastolic Blood Pressure

Changes in Heart Rate Variability

Table 3 showed the HRV variables of either time or frequency domains. There were no statistically significant differences in the HRV variables either within or between the Groups (P>0.05).

Table 3. Changes in HRV at the Beginning and After 8 Weeks of the Study in the Control Group and the Vinyasa Yoga (Training) Group.

Conditions	Control Group (n = 15)		Training Group (n = 15)	
	wk0	wk8	wk0	wk8
RMSSD (MS)	31.14 ± 3.95	31.71 ± 4.35	34.90 ± 6.33	37.68 ± 8.73
SDNN (MS)	51.09 ± 4.52	48.70 ± 4.59	52.90 ± 5.74	52.26 ± 7.81
LN(RMSSD) (MS)	4.21 ± 0.92	3.31 ± 0.15	3.36 ± 0.16	3.36 ± 0.19
PNN50 (%)	14.05 ± 4.51	13.57 ± 3.79	18.46 ± 5.89	18.46 ± 6.29
MEAN RR INT (MS)	761.91 ± 26.46	789.12 ± 30.66	759.53 ± 23.29	775.41 ± 33.40
HF Peak (Hz)	0.23 ± 0.02	0.26 ± 0.02	0.21 ± 0.01	0.21 ± 0.01
HF Power (MS^2)	513.09 ± 126.43	464.88 ± 96.02	844.53 ± 404.61	1059.82 ± 518.74
LF Peak (Hz)	0.08 ± 0.01	0.07 ± 0.01	12.28 ± 12.18	0.09 ± 0.01
LF Power (MS^2)	831.46 ± 153.02	597.63 ± 122.38	964.58 ± 267.64	963.50 ± 366.90
LF/HF Ratio	2.66 ± 0.56	1.86 ± 0.32	2.95 ± 0.50	1.60 ± 0.34
Total Power (MS^2)	1344.55 ± 220.37	1062.50 ± 189.59	1809.11 ± 500.44	2023.33 ± 710.25
RHR Min (bpm)	67.13 ± 2.56	64.867 ± 3.17	67.60 ± 2.48	67.73 ± 3.26
RHR Max (bpm)	96.13 ± 2.82	92.133 ± 2.934	96 ± 2.18	95.20 ± 2.65
RHR Average (bpm)	80.40 ± 2.77	78.067 ± 3.316	80.400 ± 2.767	78.067 ± 3.316

Values are mean ± SEM. **RHR** = Resting Heart Rate; **RHRMin** = Minimal Resting Heart Rate; **RHRMax** = Resting Heart Rate Max; **RHRaverage** = Resting Heart Rate Average; **RMSSD** = Square Root of the Mean of the Squares of Successive NN interval Differences; **SDNN** = Standard Deviation of all Normal-to-Normal R-R (NN); **pNN50** = The **p**roportion of NN intervals difference >50 ms; **HF** = High Frequency activity; **LF** = Low Frequency activity; **LF/HF** = Low Frequency/High Frequency ratio

Changes in Physical Fitness

After 8 weeks of Vinyasa Yoga training, the data showed a significant increase in hand grip strength ($P=0.002$), back strength, and leg strength ($P=0.001$), wall sit ($P<0.001$), sit and reach ($P<0.001$), and back scratch ($P<0.001$) scores (Table 3). While the other fitness variables, such as the push up and the 6-Minute Walk distance revealed no significant changes over time ($P>0.05$).

Table 4. Physical Fitness Changes after the Vinyasa Yoga Training for 8 Weeks.

Conditions	Control Group (n = 15)		Training Group (n = 15)	
	wk0	wk8	wk0	wk8
Hand Grip (kg)	26.74 ± 2.25	27.07 ± 2.21	26.97 ± 1.46	31.00 ± 2.13*
Back Strength (kg)	56.60 ± 3.26	55.67 ± 4.80	62.93 ± 4.04	72.93 ± 5.13*
Leg Strength (kg)	53.13 ± 3.79	54.80 ± 3.89	63.20 ± 6.12	82.67 ± 10.12*
Push Up (Times)	21.53 ± 1.25	20.20 ± 1.36	22.20 ± 1.68	23.47 ± 1.79
Wall Sit (sec)	64.45 ± 7.86	66.00 ± 9.14	55.87 ± 6.44	85.74 ± 10.25*
Sit & Reach (cm)	4.47 ± 2.41	4.23 ± 2.49	10.55 ± 2.76	15.13 ± 2.47*
Back Scratch (cm)	8.07 ± 0.95	6.10 ± 1.33	3.24 ± 1.61	7.70 ± 1.46*
6-Minute Walk Test (min)	561.41 ± 17.42	544.98 ± 17.16	552 ± 16.87	574.07 ± 18.53

Values are mean ± SEM. *Significant difference within the Training Group.

Changes in Saliva Cortisol

Figure 1 indicates that there was no significant difference (P>0.05) in the saliva cortisol level in the Training Group after 8 weeks of Vinyasa Yoga. Also, there was no statistically significant difference in the Control Group (P>0.05).

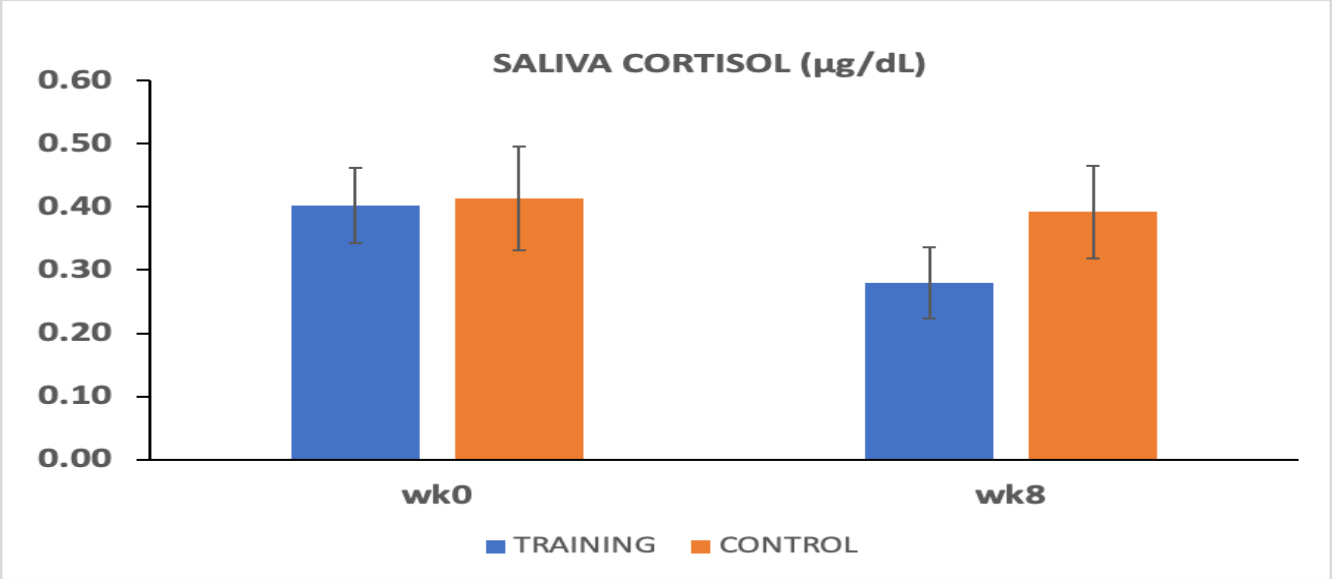

Figure 1. The Saliva Cortisol Responses of the Vinyasa Yoga (Training) Group and the Control Group from the Initial Week (wk0) to Week 8 (wk8). Values are mean ± SEM.

DISCUSSION

The purpose of this study was to determine the effects of an 8-week Vinyasa Yoga training program on stress and health related fitness variables in healthy office workers. The findings indicate that physical fitness consisting of handgrip strength, back strength, wall sit, sit and reach, and back scratch responses were significantly increased. However, there were no significant changes found in the subjects' stress, saliva cortisol and HRV after 8 weeks of Vinyasa Yoga training.

Several studies have demonstrated the benefits of using yoga or meditation to manage the stress of work life, predominantly among healthy population, people with chronic stress or diseases such as diabetes, hypertension, mental stress, musculoskeletal pain, constipation, and depressed postpartum women (2,6,27). However, none had applied the intervention with workers with a sedentary lifestyle assessing both stress level with saliva cortisol and health related physical fitness.

The anthropometric and physiologic data confirmed the normal healthy conditions of the subjects in both Groups. In addition, the subjects followed the instructions regarding physical activity participation; whereas, the Yoga Group followed their training regularly until the end of the study. Accordingly, the intervention of the Vinyasa Yoga ranged between 68.8% to 71.7% of maximum heart rate, which represents low to moderate intensity (15,21). With nature of free-hands Vinyasa Yoga, it reveals that this intervention might possibly enhance ranges of motion of the multiple joints, as well as muscle strength and endurance. The subjects in the Vinyasa Yoga training Group significantly increased their physical fitness, which is indicated by the increase in muscle strength (handgrip strength, back and leg strength), muscle endurance (push up, wall sit), and flexibility (sit & reach, back scratch). Hence, these findings are consistent with other reports of Vinyasa Yoga and the increase in physical fitness (11,14,18)

However, interestingly, the 8 weeks of Vinyasa Yoga training did not alter HRV. This means that Vinyasa Yoga did not have an influence on the autonomic regulation of the cardiac function. The reasons that explained this finding are likely due to many confound personal life factors, such as resigning from a job, family issue (e.g., a sudden death of a family member), crisis in both team and individual in the work place environment and the crucial life phase that one has to handle deal with, and the relationship problems reported in the self-mood state record provided throughout the study period. However, it is contrast with previous study which found that the 2 times$\cdot wk^{-1}$ of yoga intervention for 8 weeks affected significantly the low frequency (LF) that represents the sympathetic activity and also the LF/HF ratio, which is an indicator of the sympatho-vagal balance (5,7) while the increase in high frequency, HF, showed the activity of the parasympathetic nervous system (3).

We demonstrated a slightly lower concentration of saliva cortisol in the Vinyasa Yoga Group. Even it was tried to minimize the fluctuations from confounding factors during the previous day and collected in the early morning session (peak time), the data showed wide ranges in the concentration of saliva cortisol, but still at the normal level (10). With no changes in concentration of saliva cortisol in this study, it is possible to conclude that Vinyasa Yoga does not alter blood stress indicator. The unchanged saliva cortisol level was due to the confounding factor that was mentioned above, which does contrast with previous studies.

The recent study of various styles of yoga reported that the saliva cortisol level was lower with the higher proportion of yoga participants (6,19,20,24). The findings support that yoga may act at the level of the hypothalamus by its 'anti-stress' effects (25).

CONCLUSIONS

The 8 weeks of training of 1-hour session Vinyasa Yoga at 3 times·wk^{-1} improved the participants' physical fitness, especially in regards to the strength, endurance, and flexibility of their muscles. But the training did not have an influence on the subjects' stress, saliva cortisol levels, and HRV. It is also important to point out that this study found many confounding factors due to the life situation of the participants that may have interfered with the result. Future investigations should focus on a longer period of training and there should be more subjects recruited.

ACKNOWLEDGMENTS

The authors would like to thank all participants and the research team for their kind cooperation throughout the study. Special thanks for the "Exercise Physiology in Special Population Research Unit", Faculty of Sports Science, Chulalongkorn University.

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