Journal of Yoga and Physiotherapy
ISSN: 2476-1303

Juniper Publishers
key to the Researchers

Research Article
Volume 10 Issue 1 - June 2022
DOI: 10.19080/JYP.2022.10.555777

J Yoga & Physio

The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents

Neslihan Duruturk, Gulnihal Gulec and Nihan Ozunlu Pekyavas*

Department of Physiotherapy and Rehabilitation, Baskent University, Turkey

Submission: May 26, 2022; **Published:** June 9, 2022

***Corresponding author:** Nihan Ozunlu Pekyavas, Department of Physiotherapy and Rehabilitation, Baskent University, Turkey

Abstract

Introduction: Aim of our study was to investigate the effects of high intensity Hatha Yoga (HY) education on physical fitness, pulmonary function and quality of life in adolescents.

Methods: 28 female adolescents were randomly divided into two groups. Training group received high intensity HY training for 8 weeks. Flexibility of individuals has been determined by sit-reach; muscular endurance by sit-ups, balance by time up-go test; cardiorespiratory capacity by incremental shuttle walking test (ISWT) and respiratory functions by spirometry, quality of life has been determined by with the Quality-of-Life Scale for Children.

Results: Flexibility, muscular endurance, balance, ISWT results showed that there has been a significant improvement in yoga training group ($p<0.05$). According to spirometric test results, significant results were obtained in all measurements except FEV1/FVC in yoga training group ($p<0.05$).

Conclusions: It is thought that high intensity HY may be a safe and feasible exercise modality in adolescents.

Pain relief; Physiotherapy; Ankle mobility; Ankle injury; Musculoskeletal injury; Rehabilitation; Exercise; Physiotherapist; Orthopaedic

Keywords: Yoga; Physical fitness; Adolescent; Quality of life; Sleep quality

Abbreviations: HY: Hatha Yoga; ISWT: Incremental Shuttle Walking Test; FVC: Forced Vital Capacity; BMI: Body Weight Kilogram; PEF: Peak Expiratory Flow Rate; PedsQL: Pediatric Quality of Life Questionnaire; SN: Surya Namaskar

Introduction

Yoga, a 3000-year tradition in the Western world, is recognized as a holistic approach to health and is classified by the National Institutes of Health as Complementary and Alternative Medicine [1]. The word "yoga" comes from a Sanskrit root "yuj", which means to join [2]. Regular yoga practice improves strength, endurance, flexibility; by taking care of yourself, feeling good, existing, being healthy, strengthening [3]. Hatha Yoga (HY), which is one of the many forms or ways of yoga, is based on the knowledge, development, and balance of psychophysical energies in the body and can therefore be called "psychophysical yoga" [2]. HY focuses on the general physical condition through pranayama (breath control exercises), asana (yoga postures) and chanda (meditation). As with other types of yoga, HY aims to calm the mind. However, unlike all yoga traditions, the importance of physical movement dimension in HY is further emphasized [4]. In a study comparing classical exercise training and yoga in healthy young people, both exercise groups had positive outcomes on physical fitness, but yoga training was found to be more effective than classical exercise training in improving balance, flexibility, anaerobic power, muscular endurance and agility [5]. It is emphasized that HY application is an effective approach on cardiopulmonary capacity in healthy individuals. HY is beneficial for cardiopulmonary endurance in healthy people through body and breath control, including relaxation techniques, resulting in improved lung capacity, increased oxygen yield, low respiratory rate, and reduced resting heart rate, as outcome it provides development of general exercise capacity [6].

A pilot study aimed to evaluate the effects of HY on health-related physical fitness parameters using direct measurements informs that the 8-week HY to be practiced does not provide meaningful increase in muscle strength, endurance and the effect on flexibility and cardiorespiratory endurance in body composition and respiratory function is not clear [7]. Other studies investigating the effects of yoga have shown that practicing yoga can lead to improvements in hand grip strength

[8], muscle endurance [9] flexibility [10] and maximum oxygen consumption (VO2maks) [11]. In addition, forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV1) measurements have shown that it has positive effects [12]. Current research investigating the effects of HY includes many different bodies and breathing exercises, but the specific effects of high-intensity HY composed frequently of high-intensity sequences and mainly high-speed inversions have not yet been clarified [4]. In the study examined the effects of high-intensity HY, it is stated that there was no improvement in cardiovascular fitness after 6 weeks of training and that it could increase apolipoprotein and adipocytokine levels [4]. When we examine the studies conducted it is seen that only one study shows the specific effects of high-intensity HY program based on our literature review while there are studies on yoga and HY. The effects of high-intensity HY on other parameters of physical fitness, quality of life and pulmonary functions are not included in any studies. In addition, the effectiveness of HY and high-intensity HY training in adolescents has not yet been established. Based on these, in our study, high-intensity HY training in healthy adolescents; we aimed to investigate the effects of physical fitness, respiratory functions and quality of life on the control group. With the results of our study, it is thought that it will guide the development of programs to improve exercise habits, functional ability, physical fitness, and pulmonary functions in healthy adolescents.

Methods

The study was conducted at the Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, XXX University.

Individuals

Female adolescents between the ages of 14 and 18 were included in the study, whereas individuals with recent muscular skeletal, neuromuscular, and chronic systemic diseases that could prevent exercise were not included in the study. Before the assessments informed consent was obtained from the individuals and families by verbal and written information. The subjects were randomly divided into two groups as yoga training group and control group. High-intensity HY training average 90-110 minutes, 2 sessions per week under the supervision of the physiotherapist, once a week as a home program, was applied for a total of 8 weeks to the first group. Individuals in the second group were not included in any exercise training program and were evaluated only before and after the 8-weeks study period. Randomization of the groups was performed using computer numbering system (GraphPad Software Quick Calcs, GraphPad Software Inc., La Jolla, California, USA). According to the sample size analysis, the number of samples per group was determined as 12 in order to study to have 80% power. The primary outcome was lower extremity flexibility (GPower Version 3.0.18, Universität Kiel, Germany).

This study was approved by XXX University Medical and Health Sciences Research Committee and Ethics Committee (Project no: KA18/345). Clinical trial number of the study was NCTXXX.

Method

The socio-demographic characteristics of the participants; age, height, body weight, body mass index (BMI, body weight kilogram / height (kg/m2)) were recorded. Adolescents who participated in the study were evaluated before and after the eight-week study period with the following outcome measures.

Assessment of health-related physical fitness

Lateral flexion and back scratch tests were performed to evaluate upper extremity flexibility. For the lateral flexion test, participants were asked to spread arms with their arms parallel to their trunk and feet with shoulder width. In this position, first of all, the third leg of the right hand was distal, and the leg projection was marked, and the participants were asked to perform lateral flexion to the right. The same procedure was repeated for the left side. the distance between the starting point and end point was measured and the distance between the two points was recorded in centimeters (cm). The test was used for the best measurement evaluation with three replications [13]. For the Back Scratch Test, the dorsal side of the lower hand and the palmar face of the upper hand were placed on the back, and the distance of the middle fingers to each other was measured by tape measure and recorded in cm. The test was repeated three times for the right and left arm and the best measurement was recorded [14].

a) Sit and reach test was performed to assess lower extremity flexibility. A straight line of 30 cm length was marked as the starting line. The measuring line with a sensitivity of 0.1 mm and a length of 80 cm was prepared by gluing a tape perpendicular to the starting line and 40 cm on both sides. The point at the intersection of the starting line and the measuring line was accepted as the "0" point. Individuals were removed from their shoes and asked to separate their heels 30 cm from each other and were positioned on the edges of the starting line. Participants were asked to put their hands together on top of the measuring line starting from the starting point and placing them downwards. In order to maintain the straight position of the legs, the assistant was asked to keep as straight as possible and slowly to reach as far as possible without separating the participant's fingers from the measuring line. Measured values it was evaluated as plus (+) for extends beyond the starting point and minus (-) for those behind the starting line; and the last point reached was recorded. The test was used for the best measurement evaluation with three replications [15].

b) Time up-go test was performed to evaluate the balance levels of the patients. For the test, individuals were asked to get up from the sitting position, walk at normal walking speed, and sit back on the chair three meters away. The total time elapsed

How to cite this article: Neslihan Duruturk, Gulnihal Gulec, Nihan Ozunlu Pekyavas. The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents. J Yoga & Physio. 2022; 10(1): 555777. DOI: 10.19080/JYP.2022.10.555777

was recorded in seconds [16]. Upper extremity muscular endurance were evaluated by Sit-up Test and lower extremity muscular endurance by 30-Second Chair Stand Test. The total number of trunk flexion performed by the participants for one minute was recorded for Sit-up Test. Participants were positioned supine, hip and knees flexed, placed as plantar side of the foot to be in bed with arms crossed over shoulders. They have been instructed to perform trunk flexion for one minute and the number of repetitions was recorded [17]. For 30-Second Chair Stand Test, individuals were asked to sit on the chair and the number of sitting and getting up was recorded in 30 seconds.

In order to evaluate the cardiorespiratory endurance of the participants, Incremental Shuttle Walking Test (ISWT) was applied. The test is controlled by audible warnings between two marked points, 9 meters apart individuals were asked to walk at increasing speed with stimulus, and each meter they walk was recorded as a shuttle. Verbal stimulation was given to the subjects for them to not to reduce the speed. Before and after the test, oxygen saturation (SpO2) of the subjects was measured by finger type pulse oximeter (Model: MD300C15D, Japan), dyspnea and fatigue levels were evaluated with Modified Borg Scale [18] and systolic and diastolic blood pressures (Automatic blood pressure monitor/wrist KP-6120) were measured. The test was terminated when the individuals reached the maximum level or due to the termination criteria [19] and the total walking distance taken was recorded.

Assessment of respiratory functions

Pulmonary function test was performed with portable spirometer device (COSMED, Fitmate Pro, Rome, Italy) in back-sitting position to evaluate respiratory functions [20]. Participants were informed about the test before the pulmonary function test. Applications were repeated twice to achieve the best performance. The participant's height, weight, date of birth and gender were entered into the spirometer. The nose of the participant was closed with a latch during the test and the participant was requested to close his/her mouth firmly with no gaps. FVC, FEV1, Tiffeneau-Pinelli index (FEV1/FVC), peak expiratory flow rate (PEF) and maximum mid-expiratory flow rate (FEF% 25/75), inspiratory capacity (IC), vital capacity (VC) values were measured.

Assessment of quality of life

The form which is prepared for adolescents aged 13-18 and validated and reliable in our country of The Pediatric Quality of Life Questionnaire (PedsQL) [21], one of the most commonly used quality of life scales in international children and adolescents has been used [22]. In addition to physical health, social and emotional functionality, school functionality is also evaluated by this questionnaire. The scoring of the test is done in 3 different areas. Firstly, the PedsQL Total Score, secondly PedsQL Physical Health Score and finally the PedsQL Psychosocial Health Score, which consists of calculating the total scores of the items evaluating emotional, social and school functionality [23]. The 23 items of the scale developed for children aged 2-18 are scored between 0-100; the answers were 100 if 'never' was preferred, 75 if 'rarely, 50 if 'sometimes, 25 if 'often, and 0 if 'always,. The higher the total score, the better the quality of life [22].

High intensity exercise training program

A total of 8 weeks applied in our study, each session of the high-intensity HY program was started with 10-minute pranayama (breath) exercises as it is in classical yoga as a preliminary preparation for the participation of individuals; the program was completed by applying 10-20 minutes warming-stretching movements, 40 minutes surya namaskar (SN) sets, 20-30 minutes dynamic yoga asanas and 10 minutes savasana. Participants were encouraged to study the perceived difficulty levels between 14 and 17 using the Borg scale during the sessions [4,24].

Statistical method

The numerical data obtained from the cases were shown as mean, standard deviation (X±SD) and percentage value (%). Confidence Interval was accepted as 95% ($p<0.05$). All data were analyzed using SPSS 21.0 statistical package program. Homogeneity of the groups in terms of descriptive statistics was analyzed by Kolmogorov Smirnov Test. When the homogeneity of the data was evaluated, it was decided to use nonparametric statistical analysis methods due to the small number of people determined as a result of sample size analysis, although there was a difference between the groups at most initial values. The differences between the data obtained before and after the training were compared with the Wilcoxon test and Mann-Whitney U test. We found that group sample size of 13 achieved 85% power to show an improvement in primary outcome measurement (flexibility tests) and having a significance level (α) of .05.

Results

The study consisted of all female adolescents; total of 28 individuals, 15 individuals in the yoga training group and 13 individuals in the control group were included (Table 1). Participations in the yoga training group completed all sessions for 8 weeks. There was a significant statistically improvement in the physical fitness measurement parameters in all tests in the yoga training group ($p<0.05$). In the control group, there was a significant statistically decrease in the Left Back Scratch Test ($p=0.006$), but there was no significant statistically difference between the measurements in the other tests ($p>0.05$) (Table 2). When the differences between the physical fitness measurement parameters were examined, a significant statistically difference was found in favor of the yoga training group ($p<0.05$) (Table 2).

How to cite this article: Neslihan Duruturk, Gulnihal Gulec, Nihan Ozunlu Pekyavas. The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents. J Yoga & Physio. 2022; 10(1): 555777. DOI: 10.19080/JYP.2022.10.555777

Table 1: Descriptive statistics of cases

	Yoga Training Group (n=15), (X±SD)	Control Group (n=13), (X±SD)	Total (n=28)	p
Age (years)	15,07±0,45	16,85±0,89	15,89±1,13	≤0,001*
BMI (kg/m2)	21,76±3,69	22,02±2,88	21,88±3,28	0,771

X±SD=Mean±Standard Deviation, cm=centimeters, kg=Kilogram, BMI=Body Mass Index, m2=Square Meters, n=Number, Kolmogorov Smirnov Test, *p<0.05.

Table 2: Comparison of physical fitness measurement parameters.

	Yoga Training Group (n=15)			Control Group (n=13)		
	X±SD		p	X±SD		p
	Before Training	After Training		Before Training	After Training	
Lateral Flexion Test Right (cm)	18,42±4,19	26,42±3,87£	0,001*	23,42±3,35	22,98±3,22	0,506
Lateral Flexion Test Left (cm)	16,56±4,78	26,33±3,76£	0,001*	22,12±3,29	21,94±2,84	0,529
Back Scratch Test Right (cm)	2,48±5,34	10,44±4,07£	0,001*	4,80±4,36	4,46±4,57	0,944
Back Scratch Test Left (cm)	-2,12±7,40	5,46±7,74£	0,001*	0,76±5,63	-0,63±5,76	0,006*
Sit and Reach (cm)	11,10±6,85	20,77±7,80£	0,001*	11,28±9,21	12,19±9,08	0,345
Time Up-Go Test (sec)	5,42±1,47	4,80±0,79	0,022*	7,00±1,69	6,97±1,56	0,650
Sit-Up Test (sn)	25,20±6,44	33,26±7,48£	0,001*	27,84±8,33	26,07±5,48	0,123
Sit up-down on Chair Test (sec)	16,46±3,50	23,73±5,10£	0,001*	16,15±3,46	17,15±2,47	0,208
ISWT Distance (m)	562,80±183,21	653,40±179,73£	0,003*	595,38±159,05	609,92±144,89	0,166

cm=centimeter, n=Number, sec=Seconds, X±SD=Mean±Standard Deviation, ISWT=Incremental Shuttle Walking Test, Wilcoxon Test *p <0.05, Mann-Whitney U Test, £p<0.05.

Table 3: Comparison of pulmonary function test parameters.

	Yoga Training Group (n = 15)			Control Group (n = 13)		
	X±SS		p	X±SS		p
	Before Training	After Training		Before Training	After Training	
FEV1 (L)	2,56±0,60	2,91±0,55	0,006*	2,70±0,51	2,89±0,49	0,050
FEV1 (%)	79,13±23,12	91,06±15,74	0,009*	84,23±14,73	90,38±13,05	0,032*
FVC (L)	3,22±0,62	3,49±0,54	0,002*	3,26±0,34	3,38±0,37	0,203
FVC (%)	90,53±15,64	98,00±12,68	0,002*	90,76±10,18	95,07±7,74	0,050
FEV1/FVC	79,28±6,67	83,63±8,07	0,078	82,81±13,96	84,21±8,25	0,722
PEF (L)	3,23±0,89	4,14±1,09	0,009*	3,89±1,17	4,19±0,88	0,155
FEF%25-75 (L)	2,60±0,78	3,20±0,58	0,006*	2,91±1,09	3,18±0,96	0,119
FEF%25-75(%)	68,6±19,89	83,93±15,12	0,005*	73,53±25,66	82,61±24,54	0,068
IC	2,22±0,73	2,96±0,43	0,003*	2,54±0,46	3,00±0,89	0,030*
VC	3,01±0,52	3,27±0,50	0,021*	3,16±0,42	3,29±0,35	0,169

n=Number, %=Percent, X±SD=Mean±standard deviation, FEV1=Forced vital capacity in 1 second, FVC=Forced vital capacity, FEV1 / FVC=Tiffeneau-Pinelli index, PEF=Peak expiratory flow rate, FEF% 25/75=Maximum mid-expiratory flow rate, IC=Inspiratory capacity, VC=Vital capacity, Wilcoxon Test, *p <0.05.

How to cite this article: Neslihan Duruturk, Gulnihal Gulec, Nihan Ozunlu Pekyavas. The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents. J Yoga & Physio. 2022; 10(1): 555777. DOI: 10.19080/JYP.2022.10.555777

When the intra-group evaluation of cardiorespiratory endurance was evaluated; there was a significant statistically difference in ISWT total walking distance (p=0.003) in yoga training group. There was no significant difference in the control group (p>0.05) (Table 2). The difference between the two groups walking distance was found to be significantly higher in the yoga training group (p=0.012) (Table 3). When the differences in the pulmonary function test parameters were examined within the group, a significant difference was found in all parameters (p<0.05) except FEV1/FVC (p=0,078) in the yoga training group. A significant difference was found in FEV1 (%) (p=0.032) and IC (p=0.030) parameters in the control group. There was no significant statistically difference between the other parameters (p>0.05) (Table 3). There was no significant difference between the two groups in terms of pulmonary function differences between groups (p>0.05) (Table 3).

When the intra-group differences in the quality-of-life assessment parameters were examined, a significant difference was found in all parameters in the yoga training group (p<0.05). In the control group, there was a significant statistically decrease in the total quality of life score (p=0.020). There was no significant statistically difference in other parameters within the group (p>0.05) (Table 4). When the differences in quality of life evaluation parameters between the groups were examined, a significant difference was found in favor of the Yoga Training group in all parameters (p<0.05) (Table 4).

Table 4: Comparison of quality of life parameters.

Yoga Training Group (n=15)				Control Group (n=13)		
	X±SS		p	X±SS		p
	Before Training	After Training		Before Training	After Training	
PedsQL Total Score	1601,66±145,91	1965,00±97,65£	0,001*	1682,69±239,22	1550,00±212,86	0,020*
PedsQL Physical Health Score	580,00±64,22	678,33±53,34£	0,001*	596,15±87,10	525,00±112,73	0,068
PedsQL Psychosocial Health Score	1025,00±102,64	1296,66±95,83£	0,001*	1090,38±177,81	1025,00±153,77	0,291

n=Number, PedsQL=Quality of Life Scale for Children, X±SD=Mean±Standard Deviation Wilcoxon Test, *p <0.05, Mann-Whitney U Test, £p <0.05.

Discussion

Yoga has gained popularity among individuals from all walks of life; it is an ancient Indian practice often associated with other exercises other than yoga, including many movement-based practices, physical exercises (asana), breathing exercises (pranayama) [25]. Although many studies have been performed on HY, which is one of the forms of yoga, based on our literature review, it is seen that very few studies have examined the specific effects of high-intensity HY program [7]. The effects of high-intensity HY on muscular endurance, muscle strength, flexibility, respiratory functions and quality of life were not included in any study, and effects of high-intensity HY on cardiorespiratory endurance were not clear. The aim of this study was to investigate the effects of 8-week high-intensity HY training on health-related physical fitness parameters, pulmonary functions and quality of life in healthy female adolescents.

In all yoga traditions, it is emphasized that the development of physical fitness is most prevalent. Enhanced flexibility is one of the first and most obvious benefits of yoga [26]. With ongoing yoga sessions, it is thought that flexibility is increased by the gradual relaxation of the muscles and connective tissues surrounding the muscles and joints [27,28]. In a study consisting of 10 weeks of yoga training conducted with 14 athletes with a mean age of 19.8 years, flexibility and balance of the training were examined and flexibility and balance significantly improved [29]. In another study conducted in 21 healthy adolescents, 26 different yoga asanas were used for 8 weeks and significant improvements in muscle strength and balance were observed [30]. In the study comparing the yoga and classical exercise training by Bas et al, both exercise groups had positive results on physical fitness, but yoga training was found to be more effective than classical exercise training in improving balance, flexibility, muscular endurance in healthy young people [5]. It is stated that HY has positive effects on balance and flexibility in healthy individuals and that it can be added to exercise program for preventive purposes [31].

Reverse yoga postures and pranayama studies are considered beneficial in terms of their effects on cardiorespiratory system. In a study aimed to investigate the effects of high-intensity HY on cardiovascular fitness, heart rate regulation, blood pressure, apolipoproteins and adipocytokines. After 6 weeks of high intensity HY program; cardiovascular endurance evaluation measured by Cooper test indicated that VO2maks values increased after training in healthy individuals participating in exercise program. In addition, there was a decrease in perceived exertion and resting heart rate, and improvements in adipocytokine and apolipoprotein values [4]. Two separate studies, independent of age, sex and BMI, reported that after a regular 15-day regular yoga exercise program, resting heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure decreased significantly in normal healthy subjects [32,33]. A published meta-analysis reported

How to cite this article: Neslihan Duruturk, Gulnihal Gulec, Nihan Ozunlu Pekyavas. The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents. J Yoga & Physio. 2022; 10(1): 555777. DOI: 10.19080/JYP.2022.10.555777

that yoga exercise training was equally effective in reducing cardiovascular disease risk factors to the aerobic exercise training, such as cycling and walking [34]. In our study, ISWT was performed to determine the effect of high intensity HY training group on cardiorespiratory compliance. In our study, similar to the literature, it was seen that the total walking distance increased significantly after high-intensity HY training. The minimally significant clinical difference after training for ISWT was reported to be 48 mt (5 shuttles) for healthy individuals [35] and 35 mt (3-4 shuttles) for chronic obstructive pulmonary disease [36]. In our study, the total walking distance of ISWT after training was 90.60±75.87 in our high-intensity HY group. In this sense, this high walking distance difference shows that high-intensity HY training can be effective exercise training in the development of cardiorespiratory endurance in adolescents. It is stated that improvements in lung function are linked to the length of yoga training and pranayama studies. After pranayama intensive yoga training given to healthy adults aged between 22-55 days, 75 minutes a day for 6 days a week, it was indicated that FEV1, FVC, PEF values increased but there was no significant statistically change in FEV1/FVC ratio and yoga exercises were recommended to improve

pulmonary functions [37]. In the meta-analysis conducted by Cramer et al. in order to investigate the effect of yoga training on pulmonary functions in patients with asthma, it is indicated that FEV1, FVC, FEV1 / FVC and PEF values were increased, and this can be complementary and useful with breathing exercises for asthma patients [38]. In another study conducted on healthy sedentary men received yoga training for, 10 weeks, 90 min, an increase in FEV1, VC values after yoga according to pulmonary function test results [39]. In our study in order to compare the effects of high intensity HY exercise training including warming, pranama studies, SN and other asana poses with the control group, it was observed that there was a significant change in all spirometric measurements except the FEV1/FVC values. In the control group, no significant statistically difference was found in any parameters except FEV1 and IC after the training. When the difference values between yoga and exercise groups were compared, no statistical difference was found between the groups. When we look at other studies evaluating pulmonary functions after yoga training, it is seen that the intensity and duration of the training we applied was higher. In particular, we think that the higher improvement in respiratory functions is due to this difference. We think that our lack of significant improvement in FEV1/FVC after training may be due to the positive development in both FEV1 and FVC, similar to the study by Divya et al. [37] At the end of the 8-week study period in our control group, who did not receive any training, according to the second measurements, we think that the significant changes in FEV1 and IC values may be due to the fact that the first measurements come across to the winter months and the second measurements come across to the spring months. In the population we have taken in hand since all pulmonary function measurements consisting of healthy adolescents are within normal limits before and after training, we think that this issue should be examined in different respiratory system diseases in order to better determine the effect of high-intensity HY education on pulmonary functions. In the adolescent period, the quality of life of the individual is influenced by many factors, and in recent years studies have focused on this issue. In the studies, it was stated that individuals with low perception of subjective quality of life in adulthood are related to the problems of quality of life in early adulthood [40]. Therefore, childhood and early adulthood periods should pass as a holistic perception of well-being physically, psychosocially and biologically and it should be cured if there is any problem from these ages thus, we think that this has an important role for the individual to achieve a healthy quality of life in the future.

It was stated that yoga caused positive changes in the behaviors and mental health of school children, and this increased the quality of life of the children [41]. In another study of 12 weeks of yoga exercise program which included 173 young adults with a mean age of 18 years, the quality of life scores assessed by the General Health Questionnaire were reported to be increased and were statistically significant [42]. When the pre- and post-training data of the yoga exercise training group included in our study were compared, significant differences were found in all parameters. When the differences between the high intensity HY exercise group and the control group were examined, it was found that all score types were statistically significant in favor of the yoga exercise group. In our study, in contrast to other studies, a questionnaire developed specifically for adolescents was used to assess the quality of life of adolescents, which enables adolescents to evaluate physical health, social and emotional functionality as well as school functionality separately.

Conclusion

When we look at the results of our study and other studies conducted in this sense; strengths of our study are as follows; high-intensity HY exercise training was supervised by an experienced physiotherapist trained in this subject, the design of the study was consistent with the literature, everyone in the exercise group participated in the 8-week yoga training, and the fact that the study evaluated many parameters such as physical fitness, pulmonary function, quality of life of high-intensity HY, and no side effects were observed in any of our participants. It is also important to note that this is the first study to examine the effects of high-intensity HY on health related physical fitness, respiratory function, and quality of life in healthy adolescents. In future studies, we think that the effects of high intensity HY exercise training should be examined in more cases and different age groups and different patient populations.

Acknowledgement

All research done by the authors.

How to cite this article: Neslihan Duruturk, Gulnihal Gulec, Nihan Ozunlu Pekyavas. The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents. J Yoga & Physio. 2022; 10(1): 555777. DOI: 10.19080/JYP.2022.10.555777

References

1. K Williams, L Steinberg, J Petronis (2003) Therapeutic application of iyengar yoga for healing chronic low back pain. Int J Yoga Ther 13(1): 55-67.
2. J Lasater (1997) Psychophysiologic effects of Hatha Yoga on musculoskeletal and cardiopulmonary function: a literature review. Yoga J 137: 134-144.
3. C Collins (1998) Yoga: Intuition, preventive medicine, and treatment. J Obstet Gynecol Neonatal Nurs 27(5): 563-568.
4. ME Papp, P Lindfors, M Nygren Bonnier, L Gullstrand, PE Wandell (2016) Effects of High-Intensity Hatha Yoga on Cardiovascular Fitness, Adipocytokines, and Apolipoproteins in Healthy Students: A Randomized Controlled Study. J Altern Complement Med 22(1): 81-87.
5. Ü Baş (1998) Hatha yoga ve klasik egzersiz yaklaşımının sağlıklı gençlerde postür ve fiziksel uygunluk üzerine etkileri. Master of science disertation. Hacettepe Ünversitesi, Ankara, Turkey.
6. JA Raub (2002) Psychophysiologic Effects of Hatha Yoga on Musculoskeletal and Cardiopulmonary Function: A Literature Review. J Altern Complement Med 8(6): 797-812.
7. MD Tran, RG Holly, J Lashbrook, EA Amsterdam (2001) Effects of hatha yoga practice on the health-related aspects of physical fitness. Prev Cardiol 4(4): 165-170.
8. M Madanmohan, DP Thombre, B Balakumar, TK Nambinarayanan, S Thakur, et al. (1992) Effect of yoga training on reaction time, respiratory endurance and muscle strength, Indian. J Physiol Pharmacol 36(4): 229-233.
9. US Ray, KS Hegde, W Selvamurthy (1986) Improvement in muscular efficiency as related to a standard task after yogic exercises in middle aged men, Indian. J Med Res 83: 343-348.
10. ML Gharote, SK Ganguly (1979) Effects of a nine-week yogic training program on some aspects of physical fitness of physically conditioned young males. Indian J Med Sci 33(10): 258-263.
11. B Balasubramanian, MS Pansare (1991) Effect of yoga on aerobic and anaerobic power of muscles. Indian J Physiol Pharmacol 35(4): 281-282.
12. TK Bera, MV Rajapurkar (1993) Body composition, cardiovascular endurance, and anaerobic power of yogic practitioner. Indian J Physiol Pharmacol 37(3): 225-228.
13. M Sertel (2017) Yaşlı Bireylerde Gövde Esnekliği ve Kısa Fiziksel Performansın Denge ile İlişkisinin İncelenmesi, İnsan Ve Toplum Bilimleri Araştirmalari Dergisi 6(1): 591-601.
14. RE Rikli, JC Jones (2001) Senior fitness test manual. Human Kinetics Champaing, USA.
15. Ş İlter (2009) Çocuklara Uygulanan Farklı Otur-uzan Esneklik Testlerinin Karşılaştırılması, Master of Science Disertation, Selçuk Üniversitesi, Turkey.
16. K Siggeirsdottir, BY Jonsson, H Jonsson, S Iwarsson (2002) The Timed 'Up & Go' is Dependent on Chair Type. Clin Rehabil 16(6): 609-616.
17. N Takanori, D Shinichi, T Kenji (2013) Relationships between Sit-Ups and Abdominal Flexion Strength Tests and the Thickness of Each Abdominal Muscle. Advances in Physical Education 3(2): 84-88.
18. G Borg (1982) Psychophysical bases of perceived exertion. Med Sci Sports Exerc 14: 377-381.
19. SJ Singh, MDL Morgan, AE Hardman, C Rowe, PA Bardsley (1994) Comparison of oxygen uptake during a conventional treadmill test and the shuttle walking test in chronic airflow limitation. Eur Respir J 7(11): 2016-2020.
20. (1994) Standardization of Spirometry, 1994 Update. American Thoracic Society. Am J Respir Care Med 152(3): 1107-1136.
21. JW Varni, M Seid, CA Rode (1999) The PedsQL: measurement model for the Pediatric Quality of Life Inventory. Med Care 37(2): 126-139.
22. N Çakın-Memik, B Ağaoğlu, A Coşkun, ÖŞ Üneri, I Karakaya (2007) Çocuklar İçin Yaşam Kalitesi Ölçeğinin 13-18 yaş ergen formunun geçerlik ve güvenilirliği, Türk Psikiyatri Dergisi 18(4): 353-363.
23. JW Varni, M Seid, PS Kurtin (2001) The PedsQLTM 4.0: reliability and validity of the Pediatric Quality of Life Inventory TM version 4.0 generic core scales in healthy and patient populations. Med Care 39(8): 800-812.
24. (2012) A Manaf Yoga Asana Vücut Çalıştırma Sanatı. Yoga serisi-2. kitap. Yoga Academy, San of set, India.
25. G Duraiswamy, J Thirthalli, HR Nagendra, BN Gangadhar (2007) Yoga therapy as an add-on treatment in the management of patients with schizophrenia–a randomized controlled trial. Acta Psychiatricam Scandinavica 116(3): 226-232.
26. T Mc Call (2007) Bantam Dell a division of Random House Inc, Yoga as Medicine, New York, US.
27. K Desikachar, L Bragdon, C Bossart (2005) The yoga of healing: Exploring yoga's holistic model for health and well-being. Int J Yoga Ther 15: 17-39.
28. ML Gatantino, TM Bzdewka, JL Eissler Rnsso, ML Holbrook, EP Mogck, et al. (2004) The impact of modified hatha yoga on chronic low back pain: A pilot study. Altern Ther Health Med 10(2): 56-59.
29. PM Jay, BM Eggleston, RJ Lockyer (2016) Impact of 10-weeks of yoga practice on flexibility and balance of college athletes. Int J Yoga 9(1): 27-34.
30. CE Hart, BL Tracy (2008) Yoga as Steadiness Training: Effects on Motor Variability in Young Adults. J Strength Cond Res 22(5): 1659-1669.
31. ÖG Ülger, S Altay, E Arslan, B Başoğlu, NY Vardar, et al. (2007) Sağlıklı kadınlarda Hatha yoganın esneklik ve denge üzerine etkileri. Fizyoterapi Rehabilitasyon 18(2): 72-78.
32. S Telles, R Nagarathna, HR Nagendra, T Desiraju (1993) Physiological changes in sports teachers following 3 months of training in Yoga. Indian J Med Sci 47(10): 235-238.
33. RB Ankad, A Herur, S Patil, GV Shashikala, S Chinagudi (2011) Effect of short-term pranayama and meditation on cardiovascular functions in healthy individuals. S Heart Views 12(2): 58-62.
34. S Mayor (2014) Yoga reduces cardiovascular risk as much as walking or cycling, study shows. BMJ 16: 349.
35. VS Probst, NA Hernandesabd Denilson, RB Mesquitaa (2012) Reference values for the incremental shuttle walking test. Respir Med 106(2): 243-248.
36. SJ Singh, PW Jones, R Evans, MDL Morgan (2008) Minimum clinically important improvement for the incremental shuttle walking test. Thorax 63(9):775-777.
37. TD Satheesh, MT Vijayalakshmi, K Mini, K Asish, M Pushpalatha, et al. (2017) Cardiopulmonary and Metabolic Effects of Yoga in Healthy Volunteers. Int J Yoga 10(3): 115-120.
38. H Cramer, P Posadzki, G Dobos, J Langhorst (2014) Yoga for asthma: a systematic review and meta-analysis. Ann Allergy Asthma Immunol 112(6): 503-510.
39. K Makwana, N Khirwadkar, HC Gupta (1988) Effect of short term yoga practice on ventilatory function tests. Indian J Physiol Pharmacol 32(3): 202-208.
40. C Eiser, R Morse (2001) The Measurement of Quality of Life in Children: Past and Future Perspectives. J Dev Behav Pediatr 22(4): 248-256.
41. DL Berger, EJ Silver, RE Stein (2009) Effects of yoga on inner-city children's well-being: a pilot study. Altern Ther Health Med 15(5): 36-42.
42. C Lau, R Yu, J Woo (2015) Effects of a 12-Week Hatha Yoga Intervention on Metabolic Risk and Quality of Life in Hong Kong Chinese Adults with and without Metabolic Syndrome. PLoS One 10(6): e0130731.

How to cite this article: Neslihan Duruturk, Gulnihal Gulec, Nihan Ozunlu Pekyavas. The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents. J Yoga & Physio. 2022; 10(1): 555777. DOI: 10.19080/JYP.2022.10.555777

DOI: 10.19080/JYP.2022.10.555777

How to cite this article: Neslihan Duruturk, Gulnihal Gulec, Nihan Ozunlu Pekyavas. The Effect of High Intensity Hatha Yoga Training on Physical Fitness, Respiratory Functions and Quality of Life in Adolescents. J Yoga & Physio. 2022; 10(1): 555777. DOI: 10.19080/JYP.2022.10.555777