



# Effects of Health Qigong in Improving the Cervical and Lumbar Disc Disease and Mental Health Status of Sedentary Young and Middle-Aged Faculties

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## Abstract

**Background:** Shoulder, neck, and back discomforts and abdominal obesity caused by sedentariness are increasingly prominent in young and middle-aged population groups. Health Qigong improves physical functions and strengthens the disease resistance of exercisers. This study aims to explore health Qigong intervention's effects on the cervical vertebra, lumbar vertebra, and mental status.

**Methods:** A total of 108 sedentary young and middle-aged faculties from Yantai University in China were recruited from July to December 2020 and randomly classified into the experimental and control groups. The former received health Qigong exercises for 12 weeks, and the latter was not intervened. The total general skeletal muscle mass, range of neck joint motion, mental health, and range of waist joint motion of all respondents before and after the intervention were tested and calculated.

**Results:** The body fat rate of the experimental group after intervention was significantly lower than that before intervention ( $P<0.05$ ). The skeletal muscle mass (SMM) value was significantly higher than that before intervention. The experimental group had lower body fat rate but higher SMM value than the control group after the intervention. In addition, the range of motion (ROM) of the cervical vertebra was significantly higher in the experimental group than in the control group after intervention. Somatization, obsessive/compulsive disorder, interpersonal sensitivity, depression, anxiety, hostility, paranoia, and SCL-90 total score of the experimental group after intervention decreased significantly compared with that before intervention ( $P<0.05$ ).

**Conclusion:** Health Qigong improves the ROM of cervical and lumbar vertebrae and the mental health status of sedentary young and middle-aged groups.

**Keywords:** Health Qigong; Young and middle-aged; Cervical and lumbar disc disease; Mental health

## Introduction

Back-bending, lowering head, and fixed posture and lack of exercises due to sedentariness can impair the muscle tissues surrounding the neck and waist by stretching them for a long period. As a result, the range of motion (ROM) of neck

and waist joints is limited, and pains develop at the neck and waist (1). Sitting at any posture for 1 h causes discomforts at the shoulder, neck, and back (2). Sedentariness with head forward, humpback, and round shoulder easily causes



muscle fatigue and damages at the neck, back, shoulders, and waist, thus causing persistent pains and limited ROM of the neck, shoulder, and lumbar vertebrae. This state may also decrease the volume of general skeletal muscle fibers and mass of general skeletal muscles, increase waistline, and cause abdominal obesity (3). Shoulder, neck, and back discomforts and abdominal obesity caused by sedentariness have recently become evident in young and middle-aged groups. Physical deformation and posture changes caused by obesity, anti-collis, and lumbago might also cause psychological burdens and even psychological problems such as self-abasement and human communication disorders. These problems can further adversely affect the daily life, working, and learning of individuals.

Health Qigong is a traditional ethnic sport that combines physical activities, breathing exercises, and psychological regulation and agrees with the fitness and healthcare concept in traditional Chinese medicine (TCM). This practice improves the physical functions and strengthens the distance resistance of exercisers, regulates their moods, and improves their psychological state (4). Although Health Qigong is not a traditional rehabilitation and healthcare medicine mean, it can strengthen physical fitness and regulate breathing and thus can help in achieving physical-psychological harmony. Health Qigong shows the outstanding adjuvant therapeutic effect to obesity, hyperlipidemia, diabetes, osteoporosis, and depression (5-6). For the common shoulder and neck pains, humpback, heading down on the chest, head forward, and obesity of sedentary people, health Qigong can improve the limited motion of joints, relieve muscle tension, massage organs, and relieve moods through the general slow rhythmic exercises, thus effectively enhancing their health conditions (7). To date, health Qigong is relatively popular in the elderly group but is less practiced by young and middle-aged groups. In particular, young people generally believe that health Qigong is a senile sport and have insufficient knowledge on the exercise ways. Existing studies on health Qigong also mainly focused on the aged or middle-aged groups, and

only a few discussed its effectiveness in sedentary middle-aged people.

Hence, sedentary young and middle-aged groups must participate in reasonable sport exercises that can improve neck, shoulder, and lumbar vertebra discomforts and adjust physical postures. Among various physical exercises, health Qigong does not need machine assistance and is easy to operate, making it a relatively ideal exercise mode.

In this study, a total of 108 sedentary young and middle-aged faculties were chosen for health Qigong exercises for 12 weeks to explore the influences of health Qigong on the physical and psychological health of sedentary young and middle-aged groups.

## **Materials and Methods**

### *Respondents*

A total of 108 sedentary faculties were invited as respondents from Yantai University in Yantai City, Shandong, China from July to August 2020. The experiment lasted from September to December 2020.

Inclusion criteria were as follows: age  $\geq 18$ ; cumulative sitting time every day of  $\geq 8$  h lasting for over 1 year; normal cardio-pulmonary functions; no congenital vertebral complications and no history of the cervical vertebra or lumbar vertebra trauma; no history of muscle or bone joint diseases; and no regular exercises during daily life.

Exclusion criteria were as follows: people with cardiopulmonary dysfunction, people with congenital vertebral diseases, people with cervical vertebra or lumbar vertebra trauma, people with regular exercises, and people who cannot cooperate throughout the experiment were excluded.

This study was approved by Ethics Committee of the university. All respondents were informed of the research intention and volunteered to participate and cooperate.

The respondents were randomly grouped into experimental and control ( $n=54$ ) by the random number table. These two groups have homogeneity in gender, age, height, and body weight ( $P>0.05$ ) (Table 1).

**Table 1:** Comparison of two groups in general information

<i>Groups</i>	<i>Number of re- spondents</i>	<i>Male /female</i>	<i>Age (yr)</i>	<i>Height (cm)</i>	<i>Bodyweight (kg)</i>
Experimental group	54	34/20	21.20±1.65	170.65±11.65	68.51±13.30
Control group	54	30/24	21.85±1.21	171.87±10.74	67.64±12.45
$\chi^2$ /t value		0.614	0.946	0.544	0.338
P-value		0.433	0.347	0.587	0.736

### Methods

The experimental group received a 12-week intervention of health Qigong, three times per week, 90 min per exercise (15 min for warm-up, 60 min for exercises, and 15 min for relaxing). The exercises were organized on the playground of schools or in the gym. The teacher who is responsible for teaching health Qigong has teaching experience of more than 1 year and performing for over 2 years. Prior to practices, two sessions of cultural theoretical knowledge and practice lectures of Qigong were conducted. The experimental group increased their cognitive level on health Qigong through the lectures. Exercise contents include several sets of exercises, such as Baduanjin, Wuqinxi, Yijinjing, Liuzijue, and 12 methods of guided healthcare exercises. Under the guidance of the teacher, all respondents exercised following the actions regulated by the *Interim Procedures of Health Qigong Management*, No.4 decree of General Administration of Sports of China. During exercises, the background music with commands was played, and the respondents alternatively practiced different sets of exercises according to the commands. Meanwhile, the control group had no intervention and kept the original life habits.

### Observation indexes

The body components of two groups, including body fat rate and total general skeletal muscle mass (SMM), were tested 1 week before and after the intervention. Body fat rate was tested by bioelectrical impedance analysis. Body impedance values (gender value: male=1; female=0) were

measured through the bioelectrical impedance analysis to calculate the SMM value.

$$SMM = \left[ \left( \frac{a^2}{b \times 0.401} \right) + (c \times 3.25) + (-0.071 \times d) \right] + 5.102 \quad ,$$

[1]

Where *a* refers to height, *b* refers to impedance value, *c* is gender and *d* is age.

The ROM of the neck and waist joints of the two groups was tested before and after intervention by using the universal protractor. Under the guidance of professional physical fitness evaluators, the experimental testers were invited to accomplish the test. The ROM of neck and waist joints involves left rotating, right rotating, ante-flexion, rear protraction, left flexion, and right flexion. Error control method: before the experiment, an experimental simulation test was conducted repeatedly to ensure that all testers could proficiently master the test method. All respondents must take sufficient warm-up before the test. Every tester is responsible for testing one part, and the testing responsibility of each tester could not be changed randomly. Each index of every respondent was tested by three times, and mean values were collected.

Symptom checklist (SCL-90 scale) was sent to the two groups before and after the intervention to assess their psychological health level (8-9). According to the evaluation, the SCL-90 scale had good reliability and validity. The scale covered 90 items of somatization, obsessive-compulsive disorder (OCD), interpersonal sensitivity, depression, anxiety, hostility, fear, paranoia, mental diseases, and other 10 factors. Each item adopted the Likert 5-level scoring method ranging from 1–5 scores from “None” to “severity”. A high

score indicates serious psychological symptoms and poor mental health status.

### Statistical method

Data were processed by SPSS 23.0 software (Chicago, IL, USA). Enumeration data was expressed by percentage (%) and inter-group comparison used the  $\chi^2$  test. Measurement data were expressed by (Mean  $\pm$  SD) ( $\bar{x} \pm s$ ). Inter-group and intra-group data comparisons used the *t*-test.  $P < 0.05$  indicates a statistically significant difference.

## Results

### Changes of body composition

The body fat rate and SMM of the experimental group and control group showed no statistically significant differences before intervention. After the intervention, the body fat rate of the experimental group decreased significantly compared with that before the intervention, whereas the SMM increased evidently. For the control group, the body fat rate and SMM value showed no significant differences before and after the intervention. After the intervention, the experimental group had a significantly lower body fat rate but higher SMM than the control group ( $P < 0.05$ ) (Table 2).

**Table 2:** Comparison of body composition index of two groups before and after intervention ( $\bar{x} \pm s$ )

Inter-vention	Groups	Number of respondents	Statistical value	Body fat rate (%)	SMM(kg)
Before	Experimental group	54		23.03 $\pm$ 6.54	24.12 $\pm$ 5.24
	Control group	54		23.20 $\pm$ 5.44	23.96 $\pm$ 5.10
			<i>t</i>	0.147	0.161
			<i>P</i>	0.884	0.873
After	Experimental group	54		19.12 $\pm$ 4.45**	30.46 $\pm$ 6.04**
	Control group	54		23.36 $\pm$ 4.52	23.21 $\pm$ 4.40
			<i>t</i>	4.912	7.129
			<i>P</i>	0.000	0.000

Notes: Compared with the group before the intervention, \*\* $P < 0.05$ .

### ROM changes of cervical vertebra

All ROM indexes of the cervical vertebra of the experimental group and control group showed no statistically significant difference before intervention. For the experimental group, the ROMs of anteflexion, rear protraction, left flexion, right

flexion, left rotating, and right rotating of cervical vertebra were increased significantly after the intervention compared with those before intervention and were significantly higher than those of the control group after the intervention ( $P < 0.05$ ) (Table 3).

**Table 3:** Comparison of ROM of cervical vertebra of two groups before and after the intervention ( $\bar{x} \pm s$ )

Intervention	groups	Number of respondents	Statistical value	Anteflexion	Rear protraction	Left flexion	Right flexion	Left rotating	Right rotating
Before	Experimental group	54		41.52±10.45	26.64±5.21	23.74±4.28	28.63±7.84	49.96±10.24	61.53±10.33
	Control group	54		42.10±9.58	25.98±4.96	24.41±5.06	28.71±6.92	50.66±9.74	60.47±7.65
			<i>t</i>	0.299	0.674	0.743	0.056	0.364	0.606
			<i>P</i>	0.765	0.502	0.459	0.955	0.717	0.546
After	Experimental group	54		46.25±5.76**	29.96±5.27**	28.04±5.31	33.96±8.54	56.56±12.31**	64.64±6.42**
	Control group	54		43.35±6.55	25.52±6.33	24.58±6.33	28.90±7.63	50.84±10.65	60.78±6.88
			<i>t</i>	2.445	3.961	3.077	3.247	2.582	3.014
			<i>P</i>	0.016	0.000	0.003	0.002	0.011	0.003

Notes: Compared with the group before the intervention, \*\* $P < 0.05$

### ROM changes of lumbar vertebra

Before the intervention, the two groups showed no statistically significant differences in the ROM indexes of the lumbar vertebra. After the intervention, the ROMs of anteflexion, rear protraction, left flexion, right flexion, left rotating, and right rotating of the lumbar vertebra of the experimental group were increased significantly

compared with those before intervention. The control group showed no evident changes in ROM indexes. The experimental group had significantly higher ROM of anteflexion, rear protraction, left flexion, right flexion, left rotating, and right rotating of lumbar vertebra than the control group ( $P < 0.05$ ) (Table 4).

**Table 4:** Comparison of ROM of lumbar vertebra of two groups before and after the intervention ( $\bar{x} \pm s$ )

Intervention	groups	Number of respondents	Statistical value	Anteflexion	rear protraction	left flexion	right flexion	left rotating	right rotating
Before	Experimental group	54		52.04±11.23	23.36±4.14	20.65±5.72	19.23±4.51	21.53±7.33	22.54±5.23
	Control group	54		52.14±10.96	24.08±5.06	21.05±5.83	20.06±5.33	22.48±6.92	23.04±4.98
			<i>t</i>	0.047	0.809	0.346	0.874	0.693	0.509
			<i>P</i>	0.963	0.420	0.730	0.384	0.490	0.612
After	Experimental group	54		60.65±10.34	29.41±3.96	24.65±6.62**	23.77±3.72**	29.98±6.75**	28.75±6.34**
	Control group	54		52.06±9.87	24.17±5.40	20.95±5.61	19.85±4.60	23.01±4.52	23.31±5.26
			<i>t</i>	4.416	5.750	5.147	6.224	7.845	6.241
			<i>P</i>	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Compared with the group before the intervention, \*\* $P < 0.05$

**Changes in mental health status**

The somatization, OCD, interpersonal sensitivity, depression, anxiety, hostility, fear, paranoia, mental disease, others, and SCL-90 total scores of the experimental group and control group showed no statistically significant differences before in-

tervention. Except for somatization, fear, and mental disease, all dimensions of scores and total scores of SCL-90 of the experimental group after intervention decreased significantly compared with those before intervention and of the control group ( $P<0.05$ ) (Table 5).

**Table 5:** Comparison of mental health status of two groups before and after the intervention ( $\bar{x}\pm s$ , scores)

Intervention	groups	Number of respondents	Statistical value	Somatization	OCD	interpersonal sensitivity	depression	anxiety	hostility
Before	Experimental group	54		1.62±0.61	2.12±0.63	1.82±0.65	1.92±0.42	1.72±0.45	1.66±0.53
	Control group	54		1.59±0.44	2.06±0.57	1.77±0.50	2.05±0.51	1.69±0.51	1.68±0.48
			<i>t</i>	0.293	0.519	0.448	1.446	0.324	0.206
			<i>P</i>	0.770	0.605	0.655	0.151	0.747	0.838
After	Experimental group	54		1.60±0.53	1.85±0.52**	1.57±0.45**	1.32±0.39**	1.51±0.36**	1.23±0.36**
	Control group	54		1.58±0.49	2.08±0.63	1.79±0.63	2.10±0.47	1.70±0.55	1.64±0.51
			<i>t</i>	0.204	2.069	2.088	9.385	2.124	4.826
			<i>P</i> value	0.839	0.041	0.039	0.000	0.036	0.000
Intervention	groups	Number of respondents	Statistical value	Fear	Paranoid	Mental disease	Others	Total score	
Before	Experimental group	54		1.41±0.53	2.13±0.44	0.91±0.72	1.66±0.52	1.70±0.53	
	Control group	54		1.49±0.49	2.07±0.53	0.87±0.54	1.62±0.54	1.68±0.44	
			<i>t</i>	0.814	0.640	0.327	0.392	0.213	
			<i>P</i>	0.417	0.524	0.745	0.696	0.832	
After	Experimental group	54		1.38±.44	1.78±0.51**	0.87±0.69	1.52±0.18**	1.51±0.36**	
	Control group	54		1.42±0.40	2.03±0.47	0.85±0.46	1.60±0.12	1.65±0.32	
			<i>t</i>	0.494	2.649	0.177	2.717	2.136	
			<i>P</i>	0.622	0.009	0.860	0.008	0.035	

Notes: Compared with the group before the intervention, \*\* $P<0.05$

**Discussions**

Table 2 shows that the experimental group had significantly decreased body fat rate but increased

SMM after health Qigong intervention. This finding reflects that health Qigong exercises can change body composition as manifested by the effective decrease in body fat rate and increase in

the total general skeletal muscle mass of exercisers. Health Qigong cannot decrease the subcutaneous fat content of exercisers but can lower the body fat rate and increase skeletal muscles (10). This result agrees with the present conclusion and proves that the decreased body fat rate of health Qigong exercisers might be attributed to the increased skeletal muscle mass. Health Qigong belongs to the middle-intensity and low-intensity sport exercises, and the practice time for each set is longer than 12 min. Several repeated exercises can realize the shrinkage-stretching of muscles and improve the anti-fatigue ability of muscles. Qigong emphasizes cooperation with breathing during exercises. Through rhythmic breathing exercises, exercisers can exercise intercostal muscles, sternocleidomastoid, diaphragm and abdominal muscles, and strengthen the respiratory muscle, thus laying a good foundation for muscle strengthening and development. Under low-intensity conditions, the isometric contraction that can stretch muscle fiber is conducive to increasing muscle strengths. This phenomenon might be the major principle of the increased total general skeletal muscle mass through health Qigong (11-12).

Tables 3 and 4 show the ROMs of cervical and lumbar joints of two groups before the intervention are similar. After health Qigong intervention, a significant increase is noted in the ROMs of anteflexion, rear protraction, left rotating, and right rotating of cervical vertebra and those of left flexion, right flexion, left rotating, and right rotating of the lumbar vertebra of the experimental group. This finding conforms to another study (13) and proves that health Qigong improves the ROMs of the cervical and lumbar vertebra of sedentary people. The actions and postures of health Qigong exercises enhance the activity and stretching of cervical and lumbar vertebrae. Repeated exercises of lowering, lifting, and rotating the head can effectively stretch the anteflexion muscle groups at the lower neck and rear protraction muscle groups of the upper neck, thus relieving the excessive tension of anteflexion and rear protraction muscle groups, strengthen-

ing the activity of antagonistic muscles, and improving the ROM of neck joints (14-16).

Actions of shoulder joints, including protraction, uplifting, external rotation, and outreach can decrease the activity of back muscle groups and chest muscles, which are beneficial for the recovery of the thoracic curve and lumbar curve. Ludi, Xiongyun, Xionghuang, and Yuanti actions in Wuqinxi exercise of health Qigong can tract and stretch platysma, trapezius, longus coli, and other muscles through the rotation and lateral bending of the head; these actions increase the ROMs of anteflexion and retroextension and the left and right bending and rotating joints of neck (17-18). The Hupu action of Wuqinxi requires forward or rear protractions of spine and can train the latissimus dorsi, erector spinae, and thoracolumbar fascia on the waist and back of exercisers. These movements are beneficial to improve the ROMs of anteflexion and rear protraction of the waist (19). Actions such as Ludi, Xiongyun, Xionghuang, and Yuanzhai can provide specific stretching effects on left and right bending muscles at lumbar joints. The left and right rotations, lumbar twisting, and shoulder shaking in Xionghuang can exercise the muscles surrounding the waist and improve the ROM of joints for left and right rotating (20).

Table 5 shows that except for somatization, fear, and mental diseases, all the dimensions of scores and total scores of SCL-90 of the experimental group after intervention decreased significantly compared with those before intervention. This finding conforms to the conclusion of Yost et al (21) and verifies that health Qigong can substantially promote the psychological health of individuals. The Baduanjin exercises in health Qigong are physical and psychological regulation exercises that require exercisers to combine their actions of limbs and the idea fully to reach equilibrium and coordinated state of spiritual state and emotions. Shen et al (22) conducted an experimental study and found that after the Baduanjin exercises, the young and middle-aged groups experienced improved anxiety, depression, and tension, mental conditions, paranoia, hostility, and OCD to some extent. The mild de-

pression of faculties can be improved remarkably after Baduanjin exercises, thus proving its regulating effects on individual moods and psychological states. The whole set of actions in Baduanjin exercises of health Qigong are closely related to organ regulation. According to TCM, the organ functions of the human body are directly related to mental status. If organs are regulated well, then exercisers have good moods and excited spirits and thus improved their mental health status. In neurobiology, health Qigong requires exercisers to enter into a calm state. When  $\alpha$  wave and cortical active inhibition are strengthened strongly, the excitations of sympathetic nerves are decreased, the excitations of parasympathetic nerves are increased, the activity of dopamine  $\beta$ -hydroxylase in plasma, renin, and angiotensin is increased, and the blood pressure is decreased.

As a result, exercisers feel relaxed. Therefore, health Qigong can help exercisers calm down and relieve their anxiety (23-24).

## Conclusion

Health Qigong is a low-intensity aerobic exercise mainly composed of isometric contraction actions without external loads and evident explosive actions and hence is appropriate for sedentary people. After health Qigong exercises, sedentary people feel substantial improvement on the ROM of cervical and lumbar joints and body composition. The negative moods of teachers and students, such as anxiety and depression, are relieved remarkably. Health Qigong can effectively increase mental health level, has no limits in site and machine, and is easy to operate. Therefore, this practice is an ideal exercise to promote the physical and mental health of young and middle-aged groups.

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## Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

## Conflict of Interest

The authors declare that there is no conflict of interests.

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