

Research Article

The Benefits of Laughing Qigong on the Perceived Stress and Heart Rate

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Abstract

The main objectives of this study were to explore the influence of Laughing Qigong on health promotion using spectral heart rate variability (HRV) analysis as well as whether any changes in autonomic nervous activity occurred after participating. This study employed a cross-sectional research design and recruited participants into a Laughing Qigong or normal control group. It used questionnaires to collect data and conducted an HRV analysis checkup

before and after a Laughing Qigong intervention (30 min) was administered. Chi-square tests, Fisher's exact test, and t tests were used to assess the relationships between the frequency of Laughing Qigong and health condition, pressure, and HRV statuses. Members of the Laughing Qigong group were older with a mean age of 42.15 years, whereas that of the controls was 34 years, which reached a significant difference ($p=0.015$); no significant

differences were found in numerous other variables, including sex, diastolic blood pressure, body mass index, pregnancy status, and medical history. The Laughing Qigong group was further divided into two subgroups by exercise regularity (regular and irregular) and the data were reanalyzed, revealing some differences between the regular (n=18) and irregular (n=30) groups. In the regular group, a paired t test revealed significance in standard deviation of the NN interval (SDNN) change; however, it also revealed significantly decreased root-mean-square successive difference (RMSSD) in the irregular group. Therefore, we inferred that regularly practicing may regulate heart function. HRV analysis findings showed that the study group had higher sympathetic activity and lower parasympathetic activity, and this phenomenon was more obvious after the laughter program. Even though the influences of age, physical conditions, and external factors on HRV could not be overcome, autonomic nervous activity could reach a certain level of balance and the participants' self-conscious pressure level was lowered.

Keywords: Heart rate variability; Laughing Qigong

1. Introduction

Heart rate variability (HRV) is related to cardiovascular, psychogenic, and autonomic nervous modulation diseases. Autonomic activity can be evaluated using spectral HRV analysis. Many clinical studies have shown that both aging and illnesses lead to decreased parasympathetic activity, and furthermore, the amount of decrease is related to the severity of the illness. Therefore, how to boost parasympathetic activity has become an aim of researchers in the medical field [1, 2]. The emphasis

on health promotion and preventive medicine has been increasing. Numerous empirical skills have been applied to research on mind-body exercise, such as the effects of Tai Chi and Wai Tan Kung on autonomic nervous activity [3-7]. The key to mind-body exercises, including yoga, Tai Chi, and meditation, lies in the modulation of breathing. Through effective breathing, a high level of parasympathetic activity can be maintained and sympathetic activation can be inhibited. In addition, many studies have indicated that laughter can fight cancer, increase immune responses, and improve health. Laughter can engender positive changes in the immune, endocrine, and nervous systems as well as in pain endurance; thus, it is beneficial to health [8, 9]. In a retrospective study, Martin concluded that the advantages of laughter are providing exercise for muscles, lungs, and internal organs; enriching blood nutrition; stimulating breathing and blood circulation; helping digestion; and releasing emotions. Research results have been accumulated on the health effects of laughter, but an overall understanding of such effects is still lacking [10]. In Taiwan, laughter projects such as Laughter Yoga from India and the native Laughing Qigong have spread among communities, the military, hospitals, and various health groups. However, further research is required to confirm their health effects [11]. This research explored the influence of Laughing Qigong on health promotion by using spectral HRV analysis. Laughing Qigong was created by the Taiwanese scholar Rui-Xie Gao, and it combines the act of laughter with Qigong. The objective is to help people regress to their infancy to learn how to smile sincerely. Through natural laughter, the exercise achieves the effect of relaxation. When practitioners participate in Laughing Qigong, they spread their body naturally,

stand in a relaxed posture, slowly open their mouths, and make a long yawning sound. After gradually warming up their bodies, they release a “ha ha ha ha” sound from their bellies, which they then extend into a laugh. During the process of combining laughter with Qigong, as practitioners focus on modulating their breathing, deep laughing, body extension and relaxation, and specialized body movements, most have tears in their eyes and perhaps even phlegm in their throats. Laughing Qigong differs from Laughter Yoga because it integrates the basic theories of Chinese Qi and meridians to enhance health. Qigong has a health and medical focus and has been refined for well over 5000 years. It has “three regulations”: body focus (posture and movement), breath focus, and mind focus (meditative components) [12-14]. Laughing Qigong balances power between the body, mind, and soul through vocal, physical, and dramatic means. It not only popularizes positive mental states but also reboots people’s lives with a joyful attitude. Similar to Qigong, energy channels in the body can become relaxed. Through modulating breathing and enjoying laughter, oxygen is delivered to the lower part of the abdomen, the vibration of which massages internal organs, thereby enabling practitioners to be healthier and more joyful. Practitioners’ internal joy is reflected in their outward attitudes. Thus, through Laughing Qigong, new life habits and attitudes are spread to others.

Most retrospective studies on the effect of mind–body exercise have used an HRV analyzer as a measurement tool [15-17]. However, holistic research on the relationship between laughter and health is rare, and evaluation data on Laughing Qigong’s effect on health are particularly scant. Studies have proven that exercise training can decrease

sympathetic activation while simultaneously increasing parasympathetic activity. Nevertheless, no objective research results exist on the forms, intensity, durability, and frequency of various types of exercise training. Laughter should be a referral model of health promotion because of its possible application value and the ability to adjust biopsychosocial and interpersonal levels. However, recent studies remain short of both a consensus and evaluations of laughter’s clinical health benefits. Furthermore, the correlation between mind–body exercise and autonomic activity requires a more thorough investigation. The present study explored whether any changes in autonomic nervous activity occur after people participate in Laughing Qigong. This study was conducted to understand the correlations of demographic data, medical history, career traits, pressure, and HRV analysis between Laughing Qigong practitioners and normal controls. Furthermore, it investigated how the exercise pattern of Laughing Qigong affected HRV data to determine the associated health benefits.

2. Materials and Methods

2.1 Study population

In this study, 46 Laughing Qigong practitioners and 54 people who did not practice it were recruited. All participants were required to be aged older than 20 years. The Laughing Qigong group comprised members of the public participating in health examinations or passing by the Laughing Exercise club in the hospital, whereas the control group comprised individuals who had not practiced Laughing Qigong ever. The exclusion criteria for participation in this study were consumption of alcohol, tea, or tobacco within 1 hour before the test.

2.2 Measurements

A questionnaire was used to collect personal data, including sex, age, weight, height, and religion; information about participants' exercise habits and motivation, including the frequency, duration, place, partner, and benefits of exercise; history of illness, health situation, and smoking and drinking habits; and finally the Perceived Stress Scale (PSS). The PSS is the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in an individual's life are appraised as stressful. The questions in the PSS inquire about participants' feelings and thoughts during the previous month [18]. After participants had completed the questionnaires, they were tested using a noninvasive HRV analyzer (Medicore SA-3000P, Jamsil-dong, Songpa-gu, Seoul, Korea) for 5 mins. Subsequently, they practiced Laughing Qigong for 30 min, rested for 10 min, and then underwent testing through the HRV analyzer again. Nail polish and finger rings were required to be removed before the test.

2.3 Statistical analysis

Analyses were performed using IBM SPSS Statistics 21.0. Descriptive statistics were explored to analyze the demographic data, health status, medical history, medical records, biochemical examinations, and outcomes of HRV between the Laughing Qigong practitioners and control individuals. A Chi-square test, Fisher's exact test, and *t* test were used to assess the relationships between the frequency of engaging in Laughing Qigong and health condition, pressure, and HRV statuses.

3. Results

3.1 Demographic data comparison between Laughing Qigong group and control group

As shown in Table 1, members of the Laughing Qigong group were older, with the mean age being 42.15 years, whereas the mean age of non-Laughing Qigong control group was 34 years, and the difference was significant ($p=0.015$). The two groups differed significantly in other factors: systolic pressure (126.00 mmHg vs. 113.85 mmHg, $p=0.033$), education level (76.1% vs. 51.6%, $p=0.015$), employment status (78.3% vs. 73.3%, $p < 0.001$), frequency of regular exercise (50% vs. 7.1%, $p=0.008$), frequency of morning exercise (40.9% vs. 10.3%, $p=0.038$), frequency of exercise per week (3.53 vs. 2.83, $p=0.007$), and ability to effectively address troubling daily affairs (36.2% vs. 19.4%, $p=0.012$). However, no significant differences existed in sex, diastolic blood pressure, body mass index, religion, marital status, pregnancy status, child-raising conditions, how to learn Laughing Qigong, self-knowledge of Laughing Qigong, motivation for engaging in Laughing Qigong, places to practice Laughing Qigong, whether to practice Laughing Qigong with companions, medical history, medicine, smoking and drinking habits, and pressure index (PSS scores) between the Laughing Qigong practitioners and controls.

3.2 Comparison of HRV indicators between the Laughing Qigong and control group

Table 2 presents the HRV indicator comparison between the groups. In both tests (before and after), most heart rate indicators between the two groups exhibited no significant differences. However, in the Laughing Qigong group, the LF/HF ratio in the post-test was significantly higher (3.28 vs. 1.64, $p=0.005$),

whereas the heart burden index (root-mean-square successive difference [RMSSD]) was significantly lower (30.91 vs. 43.08, $p=0.002$) in the posttest. The PSI (pressure index) exhibited no difference. We further compared the pre- and post-test results of the groups separately, and we found that only rest could increase the RMSSD in the control group (37.62 Hz vs. 43.08 Hz, $p=0.004$) and reduce PSI (47.46 Hz vs. 33.41 Hz, $p=0.02$). However, no differences were found in the comparison of the pre- and post-test results in the Laughing Qigong group ($n=48$).

3.3 Comparison of demographic data between the regular and irregular Laughing Qigong groups

We further divided the Laughing Qigong group into two subgroups by exercise regularity. Table 3 presents a comparison of the demographic data between these groups. Regular Laughing Qigong practitioners were significantly older (59.61 vs. 28.93, $p < 0.001$) and had higher systolic pressure levels (128.50 mmHg vs. 115.56 mmHg, $p=0.039$). Moreover, most were married (66.7% vs. 36.7%, $p=0.002$), raising children (86.7% vs. 33.3%, $p=0.001$), exercised in the morning (70.6% vs. 11.5%, $p < 0.001$), exercised for longer each week (4.12 days vs. 2.79 days, $p=0.017$), suffered from chronic diseases (55.6% vs. 10.0%, $p=0.001$; especially cardiovascular diseases [$p=0.043$]), and had to take medicine more often (35.3% vs. 6.7%, $p=0.019$). Regarding pressure indicators, regular practitioners were more capable of controlling their problems (23.5% vs. 16.7%, $p=0.032$). By contrast, the irregular practitioners become involved in Laughing Qigong through the hospital's introduction (23.5% vs. 16.7%, $p=0.032$), practiced Laughing Qigong in school (59.3% vs. 18.8%, $p=0.020$), and tended to feel more pressure (5.35 vs. 3.71, $p=0.045$).

3.4 Comparison of HRV indicators between the regular and irregular Laughing Qigong groups

Table 4 presents a comparison of HRV indicators between the regular ($n=18$) and irregular ($n=30$) Laughing Qigong groups. The results showed that regular practitioners had a significantly lower HF index in both the pre and post-test periods, representing parasympathetic activity, VLF (very low-frequency), TP (total power), SDNN (Standard deviation of normal RR intervals), and RMSSD (Root mean square of successive RR interval differences), compared with the irregular Laughing Qigong practitioners. The PSI (pressure index) was significantly higher among regular practitioners than among irregular practitioners before and after implementing Laughing Qigong. Despite this, irregular practitioners tended to feel more pressure as demonstrated on the PSS (5.35 vs. 3.71, $p=0.045$; Table 3). In particular, even though most HRV parameters exhibited superior performance in the irregular group, LF/HF exhibited no significant difference between the groups. This indicates that age still plays a crucial role in HRV parameters in that the irregular practitioners were much younger than the regular practitioners. We could infer that regularly practicing Laughing Qigong can maintain autonomic balance and make practitioners relaxed.

Some differences existed between the regular group and irregular group. In the regular group, the paired t test revealed significance change in SDNN between before and after practicing Laughing Qigong (it increased from 27.46 to 33.17, $p=0.045$). However, it also revealed significantly decreased RMSSD in the irregular group after practicing Laughing Qigong ($n=30$, 41.16 vs. 37.90, $p=0.035$).

3.5 Comparisons of pre- and post-test results of HRV indicators in the regular and irregular Laughing Qigong and control groups

We compared the pre- and post-test results of HRV indicators in the regular and irregular Laughing Qigong groups and control group. The results revealed that regular practitioners had significantly

higher SDNN (heart function index) after a single session of Laughing Qigong ($p=0.045$), whereas the irregular practitioners had lower RMSSD scores after a single session. Regarding the non-Laughing Qigong control group, only rest lowered their PSI score ($p=0.012$) and increased their RMSSD ($p=0.003$), but no significant change occurred in SDNN.

Variables	LQ group practitioners (n=48)	Non-LQ group Controls (n=52)	p-value
Age	42.15 ± 20.31	34.00 ± 10.13	0.015*
Gender			0.161
male	27	21	
female	21	31	
Blood pressure			
Systolic pressure	126.00 ± 10.39	113.85 ± 9.14	0.033*
Diastolic pressure	78.33 ± 5.77	72.25 ± 8.81	0.249
BMI	22.94 ± 3.29	22.54 ± 3.46	0.556
Education (years)			0.015*
≤9	4	2	
9~12	7	13	
≥12	35	16	
Religious Belief			0.490
Buddhism	10	10	
Taoism	6	3	
I-Kuan Tao	2	0	
Christianity	8	7	
Catholicism	2	0	
none	13	11	
others	2	0	
Marital status			0.160
single	23	9	
married	21	21	
Divorced and others	1	1	
Occupation			<0.001*

business services	2	3	
free trade	3	1	
government employees	5	4	
retired	36	22	
With regular exercise			0.008*
Yes	17	1	
No	17	13	
Weekly exercise days	3.53 ± 1.42	2.83 ± 0.75	0.007*
Any chronic diseases on regular medication			0.500
Yes	7	4	
No	39	27	
Perceived Stress Scale	4.54 ± 2.55	5.25 ± 2.05	0.218

Data are expressed as mean ± standard deviation or the number. * : p<0.05

Table 1: Demographic characteristics of the Laughing Qigong and control groups.

Variables	LQ group practitioners (n=48)	Non-LQ group Controls (n=52)	p-value
Pre-test			
LF (ms ²)	1396.85 ± 3763.23	786.25 ± 1015.57	0.267
Ln LF	6.03 ± 1.45	5.91 ± 1.32	0.668
HF (ms ²)	344.99 ± 326.83	448.17 ± 446.75	0.198
Ln HF	5.24 ± 1.30	5.56 ± 1.15	0.201
VLF (ms ²)	990.34 ± 874.27	1097.46 ± 1814.19	0.714
Ln VLF	6.41 ± 1.17	6.22 ± 1.23	0.418
TP (ms ²)	2184.56 ± 1763.06	2326.60 ± 2475.18	0.746
Ln TP	7.23 ± 1.14	7.23 ± 1.06	0.985
LF/HF	3.20 ± 3.73	2.03 ± 1.98	0.053
Mean heart rate (beat/min)	73.13 ± 13.43	76.14 ± 12.17	0.247
SDNN (ms)	48.41 ± 21.65	50.55 ± 29.20	0.682
RMSSD (ms)	33.76 ± 17.98	37.62 ± 20.27	0.322
PSI	59.94 ± 99.35	47.46 ± 57.27	0.444
Post-test			
LF (ms ²)	771.87 ± 802.42	694.42 ± 1035.94	0.687
Ln LF	5.99 ± 1.44	5.85 ± 1.24	0.627

HF (ms ²)	341.68 ± 396.13	486.00 ± 417.99	0.089
Ln HF	5.16 ± 1.36	8.83 ± 20.67	0.234
VLF (ms ²)	1085.25 ± 1197.81	1343.65 ± 2712.06	0.555
Ln VLF	7.59 ± 8.12	6.40 ± 1.27	0.318
TP (ms ²)	2198.78 ± 2101.59	2526.03 ± 3388.14	0.577
Ln TP	7.20 ± 1.19	7.30 ± 1.01	0.632
LF/HF	3.28 ± 3.15	1.64 ± 2.26	0.005*
Mean heart rate (beat/min)	74.50 ± 11.03	73.10 ± 10.09	0.523
SDNN(ms)	48.77 ± 20.41	53.76 ± 24.75	0.290
RMSSD(ms)	30.91 ± 15.31	43.08 ± 21.90	0.002*
PSI	55.86 ± 104.08	33.41 ± 28.28	0.163

Data are expressed as mean ± standard deviation. * : p<0.05

Table 2: HRV variables in the Laughing Quigong and control groups.

Variables	Regular doing LQ (n=18)	Irregular doing LQ (n=30)	p-value
Age	59.61 ± 6.79	28.93 ± 9.07	<0.001*
Gender			0.371
Male	11	13	
Female	7	17	
Blood pressure			
Systolic pressure	128.50 ± 13.44	115.56 ± 8.03	0.039*
Diastolic pressure	81.50 ± 4.95	72.22 ± 7.17	0.122
BMI	23.10 ± 3.58	22.75 ± 3.39	0.746
Education (years)			0.078
≤9	1	3	
9~12	4	3	
≥12	11	24	
Religious Belief			0.129
Buddhism	4	6	
Taoism	1	5	
I-Kuan Tao	0	2	
Christianity	5	3	
Catholicism	1	1	

None	3	10	
Others	2	0	
Marital status			0.002*
Single	4	19	
Married	10	11	
Divorced and others	1	0	
Occupation			0.276
Business services	0	2	
Free trade	1	2	
Government employees	2	3	
Retired	30	6	
The time engaged in LQ			0.001*
Within half a year	5	14	
Less than 1 year	3	8	
More than 1 year	9	1	
Benefits of doing LQ			
Be healthier	6	3	0.377
Stress release	17	8	0.009*
Dissipate fatigue	5	2	0.326
Motivation			
Be healthier	12	2	0.009*
Stress release	9	9	0.124
Sport venue			0.020*
School	3	16	
Community center	0	3	
Clubs or groups	5	2	
Park	5	3	
Home	3	3	
Exercise with partners			0.057*
Never	1	1	
Rarely	5	5	
Sometimes	3	16	
Usually	9	5	
Time to exercise			<0.001*
Morning	12	3	

Noon	2	1	
Afternoon	0	9	
Night	3	12	
Other	0	1	
Weekly exercise days	4.12 ± 2.06	2.79 ± 0.42	0.017*
Exercise frequency per week			<0.001*
1~2	4	22	
3~4	3	7	
≥5	10	0	
Cardiovascular diseases	4	1	0.043*
Diabetes	1	0	0.348
Thyroid diseases	1	0	0.348
Psychiatric disorder	1	0	0.348
Any chronic diseases on regular medication			0.019*
Yes	6	2	
No	11	28	
Smoking			0.614
Yes	1	1	
No	17	29	
Drinking			0.614
Yes	1	1	
No	17	29	
Perceived Stress Scale	3.71 ± 2.13	5.35 ± 2.50	0.045*

Data are expressed as mean ± standard deviation. * : p<0.05

Table 3: Demographic characteristics of the regular and irregular Laughing Qigong groups.

Variables	Regular doing LQ (n=18)	Irregular doing LQ (n=30)	p-value
Pre-test	Mean ± SD	Mean ± SD	
LF (ms ²)	1750.65 ± 6252.93	1200.20 ± 1022.32	0.637
Ln LF	4.86 ± 1.35	6.55 ± 1.25	<0.001*
HF (ms ²)	75.03 ± 65.38	455.00 ± 315.08	<0.001*
Ln HF	3.91 ± 1.06	5.86 ± 0.77	<0.001*

VLF (ms ²)	473.85 ± 440.47	1128.43 ± 1006.64	0.004*
Ln VLF	5.70 ± 1.09	6.55 ± 1.13	0.015*
TP (ms ²)	785.53 ± 685.48	2774.62 ± 1916.90	<0.001*
Ln TP	6.26 ± 1.05	7.60 ± 0.93	<0.001*
LF/HF	4.19 ± 5.80	2.63 ± 1.73	0.293
Mean heart rate (beat/min)	78.24 ± 14.87	72.00 ± 10.93	0.142
SDNN(ms)	27.46 ± 10.67	56.74 ± 19.13	<0.001*
RMSSD (ms)	18.16 ± 8.90	41.16 ± 17.16	<0.001*
PSI	126.76 ± 142.25	28.52 ± 25.29	0.012*
Post-test	Mean ± SD	Mean ± SD	
LF (ms ²)	336.81 ± 440.24	1018.29 ± 953.48	0.002*
Ln LF	4.89 ± 1.61	6.52 ± 0.95	0.001*
HF (ms ²)	94.08 ± 75.24	420.01 ± 311.28	<0.001*
Ln HF	4.10 ± 1.20	5.75 ± 0.86	<0.001*
VLF (ms ²)	513.00 ± 612.99	1237.36 ± 1292.26	0.014*
Ln VLF	8.86 ± 13.47	6.71 ± 1.02	0.520
TP (ms ²)	943.90 ± 1010.82	2675.67 ± 2212.87	0.001*
Ln TP	6.27 ± 1.28	7.60 ± 0.77	<0.001*
LF/HF	3.41 ± 3.74	3.23 ± 3.54	0.868
Mean heart rate (beat/min)	77.18 ± 13.90	73.45 ± 8.49	0.264
SDNN (ms)	33.17 ± 17.04	55.23 ± 15.78	<0.001*
RMSSD (ms)	20.99 ± 10.65	37.90 ± 14.94	<0.001*
PSI	111.17 ± 157.86	24.66 ± 13.23	0.038*

Data are expressed as mean ± standard deviation. * : p<0.05.

Table 4: Differences in HRV variables in the Laughing Qigong group by exercise pattern.

4. Discussion

The implementation of Laughing Qigong cannot entirely overcome the influence of age on autonomic activity, but it still has the effect of maintaining heart function and relieving body–mind pressure. Moreover, the implementation of Laughing Qigong is not limited by physical factors; therefore, it is adequate for most people to participate in. Accordingly, continuing to popularize and participate

in Laughing Qigong in the future seems worthwhile. After the Laughing Qigong training, we determined that Laughing Qigong can generate positive responses such as a feeling of stress relief, a feeling of rejuvenation, and feeling better. Furthermore, through regularly participating in Laughing Qigong, even though it cannot overcome the influence of age, physical conditions, and external factors on HRV, autonomic nervous activity can reach a certain level

of balance and lower participants' self-conscious pressure levels. The study also demonstrated that performing Laughing Qigong once engendered no significant difference. Similar to exercise, Tai Chi, and Wai Tan Kung, the effect of Laughing Qigong lies in perseverance. Therefore, to strengthen the control of autonomic activity, regular and consistent participation in Laughing Qigong must be encouraged. For the young control group without regular exercise, adequate static rest was beneficial for the heart, facilitating ability and decline of pressure. Hence, from the perspective of improving autonomic nerve balance, adequate rest during work is both necessary and essential to help prevent cardiovascular disease.

The results of this study were derived from small samples, and thus, more research is required for verification. Furthermore, no strict definitions or regulations exist for the steps, methods, time, procedures, and environment of Laughing Qigong, which may influence the effect of its implementation and HRV. In the future, relevant research can be conducted on the components of Laughing Qigong or the influence of various durations of Laughing Qigong sessions on HRV. In this study, we experienced difficulty in recruiting participants; hence, a significant difference existed in the ages between the study and control groups. Age is a critical factor for HRV. The age difference made the follow-up analysis more complicated, and thus, we suggest that future researchers ensure similar ages in both groups. This will enable a clearer examination of the influence of Laughing Qigong on HRV. Overall, in this study on the relationship between Laughing Qigong and HRV, we found that a single session of Laughing Qigong did not improve HRV

significantly, but regular sessions could lead to adequate autonomic nerve balance. This caused participants to exhibit lower self-reporting pressure scores, and no significant factor interfered in the participation of Laughing Qigong. Continuing to popularize and participate in Laughing Qigong in the future seems to be worthwhile.

5. Conclusion

This is the first of a few studies focusing on Laughing Qigong's influence on HRV in Taiwan. The results indicate that Laughing Qigong practitioners exhibited the following characteristics: they were older, had higher systolic pressure, had higher education levels, were mostly retired, exercised more regularly, exercised in the morning, and managed problems in daily life well. Moreover, the HRV analysis findings show that the study group had higher sympathetic activity and lower parasympathetic activity. This phenomenon was more obvious after the laughter program's implementation, and the heart burden ability (RMSSD) was significantly lower than that in the control group. The results re-emphasize that even though the participants in the study group had superior exercise habits, they could not overcome the significant influence of age over heart ability. Thus, the study group had higher blood pressure and lower parasympathetic activity. Even the participants' heart burden ability (RMSSD), which was the same before the implementation of Laughing Qigong, was worse than that of the control group after implementation. This result is similar to those of other HRV studies and explains that parasympathetic activity as well as heart burden ability declines when people age [19]. However, no differences existed in heart function (SDNN) or pressure index (PSI) between the study

groups, even between older people and the control group before and after Laughing Qigong. This suggests that Laughing Qigong and superior exercise habits can have positive effects on maintaining heart function and unburdening people of physical and psychological pressure, even though Laughing Qigong cannot entirely overcome the age limit.

The characteristics of the regular Laughing Qigong group included the following: they were older, had higher systolic pressure, were married, had children, were retired, had heard of Laughing Qigong from sources other than through hospital activities, exercised mostly in the morning, had regular exercise habits, suffered from cardiovascular disease, and had lower self-conscious pressure. These are all commonly known. In today's busy industrial and commercial society, middle-aged and elderly people are more likely to practice Laughing Qigong, especially for those who have regular exercise routines and chronic diseases. Their awareness of self-health care and superior motivation lead them to participate more regularly. For the Laughing Qigong group, similar to a relevant study on laughing [11], the obvious benefit was relaxing. When we selected the HF practitioners among the participants in the regular Laughing Qigong group, we found that their PSI score tended to decrease after a single session. Our study confirmed once again that Laughing Qigong can generate positive responses such as stress relief, a feeling of rejuvenation, and feeling better. However, the comparison of HRV indicators in the Laughing Qigong and control groups showed that the Laughing Qigong group had no significant differences in HRV indicators before and after practicing. By contrast, for the group who only took static rest, a significant decline in average heart rate,

increase in heart burden ability, and notable decrease in pressure index occurred. Such phenomena were also observed in other studies on exercise training [19, 20]. If researchers wish to influence HRV through exercise, they require high-intensity training and long-term sustainability, and then the results will be more obvious on young people. Therefore, the nonsignificant difference in HRV before and after Laughing Qigong may be because Laughing Qigong is a club activity, has less enforcement, and participants are largely middle-aged and elderly people. Nonetheless, we also observed that after the control group took a rest, a rise in their heart burden ability and fall in their pressure index occurred. This indicates that youngsters with higher parasympathetic activity can ease the burden on their heart as well as pressure without excessive relaxation.

Finally, we performed an analysis on the influence of regular Laughing Qigong on HRV indicators; the self-conscious level of pressure was not reflected in the HRV indicators. Through the HRV test, the regular Laughing Qigong group was found to have a higher pressure index, worse heart function, and worse heart burden ability. Such results demonstrate that even for regular practitioners, age is still a critical factor influencing heart function. The higher pressure index may be caused by chronic diseases, having children, and cardiovascular disease. However, we also observed that the regular Laughing Qigong group exhibited no significant differences in balance of autonomic activity. According to this result, even though the influences of age, physical conditions, and external factors on HRV could not be overcome, autonomic nervous activity could reach a certain level of balance and the participants' self-conscious pressure level was lowered.

Author Contributions

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Conflict of Interest

All authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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