

Metabolic effects of a zen meditation and qigong training program on sedentary people

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Manuscript Preparation
- E** Funds Collection

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Abstract

Background and Study Aim:

We have reported that zen meditation with sessions of 1.5 hours increases the parameters of the lipid profile in the blood of experienced meditation instructors and that qigong exercises revert this effect. To evaluate the metabolic effects of combined meditation (zen + qigong) in sedentary people by using different durations of qigong exercises for two experimental groups.

Material/Methods:

Two groups of 20 sedentary people (average age: 29) practiced combined meditation during 5 days with sessions of 1.5 hours. The blood parameters for metabolism were determined before and after the course. Within these 1.5 hour sessions, group 2 practiced qigong exercises only half of the amount of exercises as group 1.

Results:

A drastic increase in CK activity in the blood (587 ± 430 u/l) was observed in group 1, without any significant difference in other blood parameters. In the men this increase was 10 fold, whereas in the women it was 4.5 fold in relation to the basal level. The increase in CK activity in the blood was less in group 2 (123 ± 58 u/l), and very similar in the men and women. In this group there were other gender unspecific changes, including an increase in the glucose level and a decrease in urea, triglyceride and LDL cholesterol.

Conclusions:

The metabolic response of sedentary people to combined meditation (zen + qigong) was determined principally by the duration of the qigong exercises. The CK activity increase inhibited a positive change in lipid parameters.

Key words:

qigong • zen meditation • blood parameters • creatin kinase • lipid profile

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BACKGROUND

Since contemporary life exposes the central nervous system to an excessive sensorial, intellectual, and emotional stimulation, it is necessary to develop special techniques of mental management that can allow for the more efficient use of the little time available for recovery. Ancient cultures have left us various techniques that can be useful in this sense, which we generally know as meditation and can be divided into two groups: meditation without exercise (passive) and with exercise (active). Among the active form of these techniques are those used as an important part of the mar-

tial arts, which are often not considered as meditation. The purpose of all of these techniques is to perfect our capacity to control our body and mind.

Whereas in the occidental world passive forms of meditation are more frequent, such as transcendental meditation with verbal techniques of relaxation and breathing control [1–3], in the oriental world it is more common to use active meditation with different combinations of exercises and movements, including yoga, qigong, Tai Chi, etc. [4, 5]. Passive meditation, such as zen p.e. is also found in the latter area of the world. What effect does meditation have on the stress induced consequenc-

Qigong – a Chinese system of training created to improve health, psychophysical abilities and the capacity of self-defence.

es in our bodies? It is assumed that stress maintains the metabolism and mental activity of the body in an elevated state, while meditation diminishes both such activities and thus increases the resistance to the excessive stimulation of daily life in the modern world and accelerates the recovery of a normal state.

Although there have been various published reports on the positive effect of passive meditation on the body [1,3,4,6–8], contradictions and speculation abound in this respect. It is clear that there are several variables, which influence the physiological effects, including the type of meditation, the individual characteristics of the meditator, as well as the duration of each session and the total program as a whole [9]. While the effects of qigong meditation on brain function [10,11] as well as on the cardiovascular [12], neuroendocrine and immunological [9,13,14] systems have been researched, the data regarding the effects on health are contradictory, with studies reporting various consequences ranging from beneficial consequences [15–17] to mental disorders [18–21].

Whereas stress maintains certain zones of the brain activated for too long, meditation counteracts this overstimulation by diminishing the activity of the brain in general (passive meditation) or by activating specific motor-related areas (active meditation). Even though the use of passive meditation could be useful in a person with an active lifestyle, it seems illogical to apply it to those with a sedentary lifestyle, given that this technique decreases the metabolism of such people with an already diminished physical activity. In our studies, we have observed a negative effect of **zen meditation** with very long daily sessions (1.5 hours) on the **lipid profile** in the blood of experienced instructors, which could be reverted with a qigong training program [22].

The aim of the current study is to evaluate the metabolic effects of combined meditation (active and passive) on sedentary people without experience in these techniques. Since the initial hypothesis is that the positive effects on certain **blood parameters** of sedentary people using combined meditation is due principally to the element of the qigong training program, it is of special interest to focus on the specific quantity of qigong exercises that can lead to a positive metabolic response.

MATERIAL AND METHODS

Participants and intervention: Forty professionals from large companies were divided randomly into two groups. The data of the two groups of volunteers is found in Table 1. The participants were clinically healthy (only one person, in group 2, had diabetes type 2, which was

Table 1. Data of the participants.

	N	Sex (m+w)	Age (years)	Weight (kg)
Group 1	20	15 + 5	29.4±7.7	74.6±7.5
Group 2	20	12 + 8	29.6±9.1	65.2±11.8

Table 2. Blood parameters (mean ±SD) for group 1 before and after the meditation program. *p<0.01.

Group 1	Before		After	
	Mean	SD	Mean	SD
Haemoglobin g/dl	16.3	1.8	17.2	1.8
Glucose mg/dl	70	7.8	70	8.9
Urea mg/dl	31	6.9	28	6.7
Uric acid mg/dl	6.4	1.8	6.1	1.2
Creatin kinase u/l	61	35	587*	430
Triglycerides mg/dl	193	39	171	52
Cholesterol total mg/dl	164	29	162	50
HDL-C mg/dl	30	3	32	3
(LDL+VLDL)-C mg/dl	133	30	139	35
(LDL+VLDL)/HDL	4.5	1.4	4.4	1.0

controlled), none of them was obese and the majority did not do regular exercise. Written informed consents were obtained from the subjects.

The participants received a 5-day personal improvement course, during which time they were isolated from their daily life. The principal part of this course consisted of combined meditation (zen + qigong exercises) in the morning before breakfast. In the qigong training program 7–8 sets of 8 different movements (56–64 total exercises) were included for group 1, resulting in a total time of 30 minutes dedicated to this form of meditation, like the program carried out by the instructors in the previous study [22]. Another part of the course included jogging in the forest (15 minutes, pulse 110–130 p/min) followed by stretching exercises and psychological motivation (15 minutes). During the rest of the day, the participants were given theory related with personal improvement. Two weeks later, group 2 carried out the same course with combined meditation, but with only half of the qigong exercises.

Capillary blood samples were taken from a finger on an empty stomach before (on Monday) and after (on Saturday) five days of treatment. The hemoglobin concentration in the blood was determined, as were the following blood parameters in serum: glucose, urea, creatine kinase (CK, 25°C), triglycerides, total cholesterol, and HDL cholesterol (HDL-C). A semi-automat-

Creatine kinase (CK) – an enzyme, which plays an important role in the muscular work. Elevated levels of CK the blood indicate muscle or brain damage.

Zen meditation – a form of psychical training in a sitting position that aims to gain control over mind.
Lipid profile – amounts and proportions of different types of fats in the blood; a series of tests used to measure them.

Blood parameters – amounts of different components in a given unit of blood.

Table 3. Blood parameters (mean \pm SD) for group 1, analyzed by gender, before and after the meditation program. * $p < 0.05$; ** $p < 0.01$.

Group 1	Men				Women			
	Before		After		Before		After	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Haemoglobin g/dl	16.9	1.5	17.7	1.6	14.2	1.1	15.4*	1.2
Glucose mg/dl	70	8.6	72	9.7	70	5.4	66.0*	3.5
Urea mg/dl	33	6.5	30	6.6	27	7.4	22*	1.3
Uric acid mg/dl	7.0	1.6	6.6	1.0	4.7	0.8	4.9	0.9
Creatin kinase u/l	71	34	736*	416	30	5	140*	41
Triglycerides mg/dl	199	44	178	59	177	14	150**	8
Cholesterol total mg/dl	171	29	166	56	143	18	151	30
HDL-C mg/dl	29	2.5	31	3.3	33	2.9	33	4.0
(LDL+VLDL)-C mg/dl	141	30	146	35	110	17	119	27
(LDL+VLDL)/HDL	4.9	1.3	4.7	0.9	3.3	0.6	3.6	0.6

ic photometer (Microlab 300) and enzymatic reactive (RANDOX) were used. The HDL-C was determined in the supernatant after precipitating the serum with a solution of phosphotungstic acid and magnesium chloride. A standard solution or control serum was used for all determinations. The variability for determination of the blood parameters was between one and three percent, depending on the specific parameter. Variance analysis (t-test) and correlation (Pearson) was calculated with an SPSS program.

RESULTS

Metabolic response of group 1: For group 1, the average levels of the blood parameters measured before and after the program are given in Table 2. While a 10 fold increase in CK activity compared to the base level can be appreciated, there were no significant changes in the other parameters.

The data of this group is analyzed by gender in Table 3. The men showed a 10 fold increase in CK activity, compared to a 4.5 fold increase for the women. Whereas in the men there was no other significant change in other parameters, in the women a significant increase can be appreciated in hemoglobin, and a significant decrease in glucose, urea and triglyceride concentrations.

Metabolic response of group 2: For group 2, this practiced qigong exercises for half of the time that was used by first group; the average levels of the blood parameters before and after the program are given in Table 4. While the increase in CK activity was significant, it was notably less than for group 1. At the same time, there

Table 4. Blood parameters (mean \pm SD) for group 2 before and after the meditation program. * $p < 0.01$.

Group 2	Before		After	
	Mean	SD	Mean	SD
Haemoglobin g/dl	16.2	1.8	15.7	1.8
Glucose mg/dl	66	8.4	85*	12.2
Urea mg/dl	33	5.5	30	6.0
Uric acid mg/dl	7.1	1.1	6.8	1.0
Creatin kinase u/l	58	44	123*	58
Triglycerides mg/dl	170	51	158	32
Cholesterol total mg/dl	193	33	168*	32
HDL-C mg/dl	44	6	42	6
(LDL+VLDL)-C mg/dl	149	35	126*	32
(LDL+VLDL)/HDL	3.5	1.1	3.1	1.0

was a significant increase in the glucose levels and a significant decrease in the levels of total cholesterol (LDL + VLDL)-C. The decrease in triglyceride levels was at the limit of significance ($p = 0.061$).

The data of this group is analyzed by gender in Table 5. The increase in CK activity was significant in both the men and women, while the decrease in the urea concentration was significant only in the men. In spite of the fact that the women showed a lower average level of CK activity compared to the men, the increase was greater in the former (2.7 fold for the women vs 1.9 fold for the men). A decrease in total cholesterol was observed in both the men and women, but was only significant in the former. There was a significant decrease in HDL-C for the women.

Table 5. Blood parameters (mean \pm SD) for group 2, analyzed by gender, before and after the meditation program. * $p < 0.05$; ** $p < 0.01$.

Group 2	Men				Women			
	Before		After		Before		After	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Haemoglobin g/dl	16.9	1.0	16.5	1.0	14.9	2.2	14.1	2.0
Glucose mg/dl	68	8.9	91**	10.0	64	8.1	78**	10.7
Urea mg/dl	35	5.3	31*	5.6	30	5.6	28	6.8
Uric acid mg/dl	7.7	0.9	7.3	0.9	6.2	0.8	6.0	0.7
Creatin kinase u/l	69	53	134*	72	40	17	108**	29
Triglycerides mg/dl	187	35	167	32	125	27	137	21
Cholesterol total mg/dl	207	34	176*	36	172	22	156	24
HDL-C mg/dl	43	5.7	41	5.5	49	1.9	45**	3.7
(LDL+VLDL)-C mg/dl	165	35	135*	37	124	22	111	22
(LDL+VLDL)/HDL	4.0	1.0	3.4*	1.0	2.6	0.5	2.5	0.5

DISCUSSION

In our previous study, it was noted that when meditation instructors with a sedentary lifestyle practiced only passive meditation (zen), there was a negative effect on the lipid profile in the blood. For this reason, qigong exercises were added to the meditation program and after only one week, a positive effect on the lipid profile in their blood was observed, while no significant change was found in their CK activity [22].

In the current study the same program of combined meditation was applied to sedentary people without meditation experience (group 1), resulting in a drastic increase of CK activity, but no significant change in the lipid profile of their blood. The application of only half of the time of qigong exercises to sedentary people without meditation experience (group 2) resulted not only in a significantly lesser increase in CK activity than for group 1, but also in a positive effect on the lipid profile.

There are two possible reasons for the lack of significant change in the CK activities of the meditation instructors of the previous study [22] compared to the significant difference in such activity in the current study. One month before the previous study, the instructors received classes in which they practiced qigong exercises for 1 hour daily during three weeks. When the study began, their organisms may have still been adapted to this type of exercise and hence it did not represent a change for them. The other possible explanation is that the age of the instructors was greater than the participants in the current study.

An increase in CK activity in the blood in healthy people is related to physical activity and is interpreted as an

index of muscular damage. There were two elements of physical activity in the program of the current study: 1) half an hour of isometric qigong exercises during a meditation session of 1.5 hours, and 2) 15 minutes of jogging combined with 15 minutes of stretching and psychological training. The second factor, which included a very light physical load, can be discarded as having any effect on CK activity. Therefore, the qigong training program provoked this muscular damage in the individuals in group 1.

There are reports of isometric and eccentric exercises significantly increasing the level of CK activity in the blood [23]. In an unreported study, we observed an increase of up to 700–1200 u/l in CK activity in the blood of young women involved in synchronized swimming, after carrying out one week of isometric exercises out of the water, in which they held the same position for minutes. This type or duration of exercise is not common in the daily life of most people.

In a recent study [12] the enzymatic response and lipid profile was determined in a group of students (average age: 20) after one month of qigong meditation that was practiced 30 minutes daily. A significant decrease was observed in the activities of GOT, GPT, and GGT, as well as the urea concentration. Yet, there was only a tendency to a change in the lipid profile. The level of CK activity was not measured.

In the current study the data in relation to the lipid profile and urea concentration in group 1 (average age: 29.4) coincide with this recent study. On the other hand, for group 2 (average age: 29.6) the fact that there was a positive effect on the lipid profile after one

week of combined meditation implies that this effect depended on the duration of qigong exercises per session. Thus the recommended duration of qigong exercises for sedentary adults should be less than that commonly used in various studies of qigong training programs [12,24,25].

The fact that the average level of CK activity (140 vs. 736 u/l) and the increase in CK activity (4.5 vs. 10 fold) after one week of combined meditation was much less for the women than the men in group 1, and that only for the women a significant decrease was found in triglyceride levels and urea concentration (representing a positive metabolic response), it can be concluded that the excess of qigong exercises applied to this group had less negative effect on the metabolism of the females. In group 2 the average CK activity was also greater for the men, who also showed a significant decrease in (LDL+VLDL)-C. On the other hand, the women of this same group only showed a tendency towards a decrease in the latter parameter. At the same time, a significant decrease in HDL-C was observed in these women. That is, the metabolism of women was more conservative regarding its response to combined meditation as a stimulus.

The mechanisms responsible for the metabolic effects of meditation are still not clear. The increase in glu-

ucose levels and the decrease in the concentrations of triglycerides and urea in group 2 could be interpreted as a greater participation of fats as a source of the energy required by combined meditation. This explanation coincides with the decrease in “bad” cholesterol. Nevertheless, we cannot rule out the possibility that the principal effect of meditation is to reduce the blood pressure and blood flow in general, whose effect in the liver would be reflected in the urea concentration and the levels of various enzymes and lipoproteins. There are reports that transcendental meditation diminishes blood flow in the liver [7] resulting in a hypometabolic effect in this organ, which would then be reflected in various related blood parameters.

CONCLUSIONS

The metabolic effect of combined meditation on the lipid profile of people inexperienced in these techniques was mainly determined by the duration of qigong exercises in the meditation sessions. The quantity of these exercises used in a meditation session in the majority of reported studies (64 exercises in all) provokes damage to muscle tissue that distorts the metabolic response in sedentary people. With a program, employing only half of these exercises in daily combined meditation sessions in this study, after only one week there was a positive effect on the lipid profile in the blood.

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