

# Creating a Proactive Behavior towards Exercising after a Transient Ischemic Attack

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## Abstract

Nowadays society is facing a constant increase in the level of stress, diversity and complexity of daily activities. The cardiovascular and cerebrovascular diseases have increased alarmingly, putting individuals' lives at risk. People face insecurity and unfortunately become sick at young ages. Moreover, the vast majority of the world's population has a sedentary lifestyle which raises the risk of severe health problems.

Stroke has become a major public health problem, with almost 16 million new cases around the world annually. It is also being considered a burden for the national economies and a real life tragedy for the patients and their families; therefore, preventing its occurrence is of great importance. Changing a person's behavior relating to a healthy lifestyle may decrease the risk of stroke and its impairments.

The aim of this research is to prove that constant and systematized physical activity has a significant role in the diminishment of the modifiable stroke risk factors for the patients who have a history of transient ischemic attack. This may change their behavior towards exercising to a proactive one.

The study was performed in Bucharest, on a small group of 10 subjects and lasted for 6 months. The results were positive and encourage us to extend the research on larger groups of subjects.

**Keywords:** Kinetic programs; Transient ischemic attack; Stroke; Sedentary

## Introduction

According to the WHO statistics, up to 85% of the world's population has a sedentary lifestyle which is associated with high mortality rates due to consequent severe diseases [1]. Statistics also reveal that stroke is the second death cause worldwide after the cardiovascular diseases, being also considered one of the main severe disability causes in individuals [1]. In the past 10 years in Europe there were registered more than 1 million deaths in stroke patients [2]. Nevertheless almost 80% of stroke cases can be prevented by reducing the individual's personal risk [3]. A recent study has proven that exercising 5 times per week decreases the incidence of stroke in adults [4].

According to the latest statistics, Romania is amongst the first 10 European countries regarding stroke incidence, counting about 200 new cases for 100000 inhabitants and it is also a leading country in post-stroke deaths [5].

Estimations reveal that the number of elders will double by the year 2050, reaching 2 billion individuals [6]. One of the non-modifiable stroke risk factors is age above 55. Therefore WHO statistics show that 195000 new stroke cases will occur annually by 2020, taking into consideration the constant progression rates [7].

A transient ischemic attack increases the risk of stroke. According to the Academician Professor Constantin Popa the risk is 3% in the next 2

days, 5% in the next 7 days, 8% after 30 days and 10% after 3 months [8,9]. In 10% of the cases stroke occurs in the first 48 hours after the transient ischemic attack [10].

The theories and models of the human behavior are derived from all the disciplines of the social sciences. Over time there have been done many attempts to describe different behavior models related to various situations [10]. The nature of the human being makes him responsible of his own life. Each individual's behavior represents a function of his decisions and, consequently, he can subordinate his feelings to a personal system of values.

Each of us is having the initiative and responsibility in determining a certain event. Proactive individuals have the ability of recognizing this responsibility and do not link themselves to circumstances, conditions and conditioning in making decisions. Their behavior is the result of their conscious choices, based on their personal system of values, and not the result of feeling related conditioning [11].

Therefore, it can be stated that, through their nature, human beings should be proactive. Choosing a condition based lifestyle is the result of their conscious decision of accepting the conditioning as a behavior changing element. In such situations, proactivity turns to reactivity [11].

Constant practice of physical activity generates biopsychosocial benefits. In a sanogenic approach this means obtaining and maintaining health through a balance of physical, psychological and social parameters. As a result there occurs a change of the individual's

lifestyle with a development of a proactive behavior towards exercising. This type of behavior will improve the individual's quality of life.

## Research Methodology

### Scope

The scope of the research is to determine whether the use of individualized and specialized kinetic programs contributes to the stimulation of a proactive behavior towards exercising in subjects with a history of transient ischemic attack.

### Hypothesis

The systematic use of specific individualized kinetic programs determines the improvement of the subjects' exercise capacity after a transient ischemic attack.

Constant exercising leads to the improvement of the subjects' body composition, reflected in the decreasing of the body fat level.

### Subjects

The study was conducted on a group of 10 subjects, 4 women and 6 men, aged 45 to 60, in a wellness club in Bucharest. Each subject was included in a 6 months training program, from March 2014 to November 2014.

The subjects were selected according to the following inclusion criteria:

Age between 45 and 60 years old;

Subjects that did not practice any performance or mass sports in their childhood;

Sedentary subjects;

Subjects that had a transient ischemic attack 3 to 6 months before;

Risk factors: high blood pressure, overweight, type 2 diabetes, hypercholesterolemia; throughout the experiment, the subjects were under treatment with specific medication such as antihypertensives, antithrombotics, B6 and B12 vitamins.

The subjects were informed about the study and signed an agreement about their participation within it.

The exclusion criteria were:

Age under 45 and above 60 years old;

Clinically healthy subjects;

Subjects that practiced a performance or mass sport in their childhood;

Constant practice of physical activity, with no interruptions;

## Methods and Materials

In designing the study we used the following research methodology: the bibliographic research, the observation research, the experimental research, the survey, the statistical analysis, the graphic representation, as well as various specific functional and anthropometric assessment tests. To test the hypothesis we used the paired t-Test.

Each subjects' anthropometric and functional parameters were assessed prior to their inclusion in the individualized training program. We used the following tools to carefully monitor their blood pressure, resting and exercise heart rates: a Polar monitor watch, a treadmill and a Tanita SC-240 electronic scale.

The assessment tests consisted of:

The computerized scale analysis necessary for the determination of the subjects' body composition—each component of the subjects' body composition was measured with the Tanita electronic scale;

An adapted Balke Treadmill Protocol—after a 10 minute warm up on the treadmill, the subjects were tested at a moderate pace at various inclination degrees with a constant speed of 5.3 kmph for the men and 4.5 kmph for the women. The protocol ended when each subject's heart rate reached 70% of its maximum, without overcoming 130 bpm. The maximal oxygen uptake was determined indirectly using the specific formulas of the Balke's protocol.

By the age of 18-25 years old, VO<sub>2</sub> max has an ascending trend. It is then followed by a plateau and, after 30 years old, it is descending. In the case of sedentary individuals it can drop with as much as 10-20% by decade, this decline being determined by the lack of physical activity [12].

The kinetic programs we used had an intensity of 60-70% of the maximum heart rate, EHR= 60-70% (220-age), respectively. They consisted in simple physical tasks, performed with or without any devices and focused on the total body training and the improvement of the subjects' motor ability. We monitored their exercise heart rates with the monitor watch, thus determining the optimal training intervals.

Dragnea A and Teodorescu S (13) have described the following exercise parameters: exercise duration, frequency, intensity and type [13]. We used the same parameters to describe the effort that our subjects were submitted to:

Duration—we started with 30 minutes trainings and increased progressively so that after 3 months we reached a total of 45-50 minutes sessions; for each session we used a maximum of 5-7 exercises, in 3-4 sets of 10-30 seconds each. Rest time in between sets was half of the training time. As the subjects' condition improved, we increased the time of each set progressively without overcoming one minute;

Frequency—3 times a week;

Intensity—moderate exertion;

Type—aerobic exercises that targeted a specific strength, balance, mobility and conditioning training closely correlated with the rehabilitative approaches of the subjects' physical impairments (e.g. pain, lack of joint mobility or stability caused by arthrosis).

At the beginning of each session the subjects performed a 15 minutes warm up, as follows:

10 minutes walking on the treadmill or riding on the cycle ergometer;

5 minutes stretching and gymnastics designed to selectively influence the locomotor system.

The subjects had also a 5 minute rest time at the end of each training session. It consisted of stretching, respiration exercises or treadmill walking.

The subjects were submitted to interim assessments after 6 weeks and 3 months from the beginning of the experiment. We adjusted the training parameters according to their results. The final assessment was taken after 6 months. We related to the same methodology as the one used at the initial assessment.

## Results

As a result of the initial and final assessments, we collected a series of data that we systematized and analyzed in accordance to the following tables (Tables 1-4).

Parameters	Subjects									
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Gender	M	F	F	M	M	F	M	F	M	M
Age (years old)	48	57	59	50	55	49	60	59	51	60
Height (cm)	176	164	177	180	176	165	175	168	170	187
Weight (kg)	92.5	72	82.4	124	98	79	98.7	76.3	107	91.7
BMI (kg/cm <sup>2</sup> )	29.9	26.8	26.3	38.2	31.6	29	32.2	27	37	26.2
Body fat (kg)	29.4	24.8	25.7	40.6	31.3	24.7	31.3	25.6	37.6	25.7
Body fat %	31.8	34.4	31.2	32.7	31.9	31.3	31.7	33.6	35.1	28
Lean body mass (kg)	63.1	47.2	56.7	83.4	66.7	54.3	67.4	50.7	69.4	66
Muscle mass (kg)	59.5	44.7	54.3	79.5	63	51.4	64.2	48.3	65.8	62.2
Total body water (kg)	47.7	31.6	36.9	50.1	46.4	34.5	45	33.1	52.5	47.7
Bone mass (kg)	3.6	2.5	2.4	3.9	3.7	2.9	3.1	2.4	3.6	3.8
Visceral fat (level)	11	9	9	20	12	11	9	12	18	10
Metabolic age (years old)	55	63	64	65	64	54	67	65	67	62

**Table 1:** Body composition-initial assessment.

Parameters	Subjects									
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
BP (mmHg)	135/75	120/65	135/70	140/85	125/70	140/75	140/80	135/75	140/80	130/70
RHR (bpm)	76	66	72	79	69	77	75	67	78	75
EHR (bpm)	120	115	115	120	115	120	115	115	120	115
VO2 max (ml/min)	24.38	12.29	12.2	20.16	21.17	11.49	22.33	12.45	20.95	23.87

**Table 2:** Functional parameters-initial assessment.

Parameters	Subjects									
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Gender	M	F	F	M	M	F	M	F	M	M
Age (years old)	49	58	59	51	56	49	61	60	52	60
Height (cm)	176	164	177	180	176	165	175	168	170	187
Weight (kg)	86	67.2	75.3	114	90	70.2	92.7	71.2	98	88.6
BMI (kg/cm <sup>2</sup> )	27.8	24.9	24	35.2	29	25.8	30.3	25.2	33.9	25.3
Body fat (kg)	24.2	20.7	19.1	32.1	23.7	16.3	25.8	21.1	30.2	23.1

Body fat %	28.1	30.8	25.4	28.2	26.3	23.2	27.8	29.6	30.8	26.1
Lean body mass (kg)	61.8	46.5	56.2	81.9	66.3	53.9	66.9	50.1	67.8	65.5
Muscle mass (kg)	58.2	44	53.8	78	62.6	51	63.8	47.7	64.2	61.7
Total body water (kg)	49.8	34.5	39.1	53.4	48.2	37.1	48.3	35.6	55.7	50
Bone mass (kg)	3.6	2.5	2.4	3.9	3.7	2.9	3.1	2.4	3.6	3.8
Visceral fat (level)	9	7	8	14	10	10	7	11	15	8
Metabolic age (years old)	51	59	60	63	57	50	62	59	61	56

**Table 3:** Body composition-final assessment.

Parameters	Subjects									
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
BP (mmHg)	130/75	120/70	135/75	135/70	120/70	130/75	135/75	130/70	140/75	120/65
RHR (bpm)	74	66	70	75	63	74	70	63	76	71
EHR (bpm)	120	115	115	120	115	120	115	115	120	115
VO2 max (ml/min)	29.43	14.95	14.3	22.74	23.73	15.16	25.16	15.17	23.91	26.57

**Table 4:** Functional parameters-final assessment.

## Discussion

The results of the initial computerized analysis reveal the following:

The subjects have a high level of body fat. Generally, body fat has variations according to the individual's age, diet and type of physical activity. The minimum percentage necessary to maintain an optimal health of men is 5%, while for women it is 12% [12].

BMI is above normal, registering values between 26.3 kg/cm<sup>2</sup> and 38.2 kg/cm<sup>2</sup>. According to the UN data in 2003, 60% of the subjects are overweight, 20% have a moderate obesity and 20% have severe obesity [12].

Visceral fat levels exceed the normal ones in the case of subjects 4 and 9. The normal values are considered to be between 1 and 12 [14].

Total body water is below normal. Its percentage should normally be 55% for women and 60% for men [12].

The data we collected, along with the chronic diseases of each subject and the presence of a transient ischemic attack in their medical history, suggest their extremely high risk of cardiovascular disease or stroke. The risks are greater with age. Moreover, individuals whose BMI exceeds 25 kg/cm<sup>2</sup> have a higher mortality rate, 50% higher in case of a BMI greater than 30 kg/cm<sup>2</sup> [12].

The initial assessment reveals very low maximal oxygen uptake levels compared to the normal ones based on age and gender.

The following conclusions can be drawn from the data analysis of the final assessment:

Body weight values registered an average diminished of 6.74%. The most important lessening was registered by subject 4 who lost 8.06% of his body weight.

BMI decreased in all ten cases and reached values between 24 kg/cm<sup>2</sup> and 35.2 kg/cm<sup>2</sup>. At the final assessment, 20% of the subjects have normal weights, 50% are still overweight, 20% have a moderate obesity and 10% have severe obesity.

Body fat percentage decreased with an average of 4.54%. The biggest drop, of 8.1%, was obtained by subject 6.

Total body water percentage increased, but the values are still under the optimal ones.

Visceral fat levels decreased, yet 20% of the subjects still have harmful values.

Metabolic age had an average diminishment of 5%.

At the moment of the initial assessment, the subjects had a very poor training level and got tired quickly. Because of the transient ischemic attacks they have experienced 3 to 6 months earlier and taking into account their high blood pressures, the heart rates we have trained them at reached 70% of their maximum heart rate.

As the training sessions progressed, the subjects' heart rate levels improved. For example, while at the initial assessment subject 1 needed 6:50 minutes to complete the adapted Balke protocol at a 4.8 treadmill inclination degree and a 120 heart rate, the same heart rate was reached after 10 minutes at the final assessment on a 6.6 treadmill inclination degree.

We observed that the subjects above 50 years old had an overall assessment time improvement of 30-35%, while those under 50, improved their time with almost 50%.

Therefore, at the final assessment, the maximum oxygen uptake had an average increase of 2.983 ml/min. The values are still very poor in accordance to the subjects' age and gender. We did a graphic representation of these values in Chart 1.

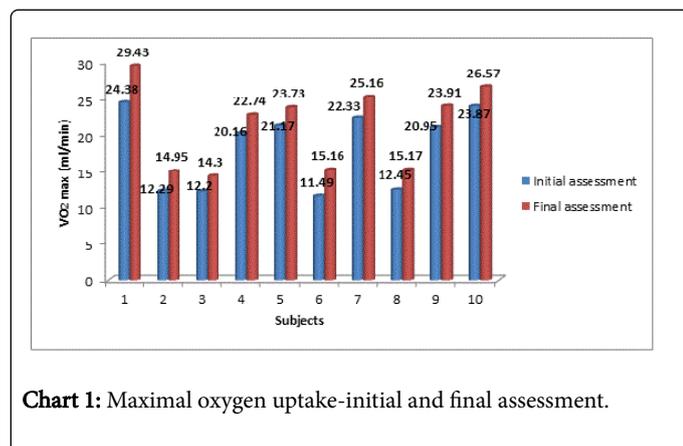


Chart 1: Maximal oxygen uptake-initial and final assessment.

## Hypothesis Validation

### Hypothesis a

The systematic use of specific individualized kinetic programs determines the improvement of the subjects' exercise capacity after a transient ischemic attack.

To validate the hypothesis we used the paired two-sample Student's t-test, at a significance value  $\alpha < 0.01$ . t Critical one-tail value is smaller than the absolute value of t Stat,  $2.896 < 19.774$ , proving that the results are statistically significant with a probability of 99%, therefore the hypothesis being valid. We can consequently state that the kinetic programs we designed for the research subjects determined an improvement of their exercise capacity.

### Hypothesis b

Constant exercising leads to the improvement of the subjects' body composition, reflected in the decreasing of the body fat level.

For the validation of this hypothesis, we also used the paired two-sample Student's t-test, at a significance value  $\alpha < 0.01$ . As well as in the first case, we can observe that the value of t Critical one-tail is below the one of t Stat ( $3.35 < 8.15$ ). Therefore, with a probability of 99%, the results are statistically significant. This means that, at the end of the 6 months training, the analyzed subjects registered a diminishment of their body fat levels.

## Conclusion

According to WHO, it only takes 30 minutes of moderate-intensity physical activity five days per week to improve and maintain health.

The kinetic programs we designed determined the improvement of the subjects' exercise capacity and body composition. Though the findings are not new in this field of research, they are nevertheless important in nowadays society, where sedentariness and disease are at large.

The research subjects changed their behavior towards exercising drawn by the positive results they have obtained. They continued training three times a week, thus integrating sports into their lifestyle. This is a characteristic of proactivity, yet it cannot be stated that their behavior has definitely changed according to a significant statistical methodology.

Variance is higher than 10% therefore the data cannot be generalized. This is due to the low number of subjects included in the research. A more significant group regarding its volume should be analyzed for better results. For the best results it will also be necessary to compare the results with age-matched subjects with same vascular risk profile but without a history of transient ischemic attack.

The paper may be used as a positive reference in research because the training methods are simple and safe to use for individuals with severe medical conditions. It also encourages the use of the specific methodology in future researches.

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