

МЕДИЦИНСКИЕ НАУКИ**THE INFLUENCE OF PHYSICAL ACTIVITY ON PHYSICAL WORK CAPACITY AND FUNCTIONAL CONDITION OF THE CARDIOVASCULAR SYSTEM****Zaharieva Kristina***Biologist, Philosophy Doctor, Associate professor
Ruse University "Angel Kanchev", Ruse, Bulgaria***Sherbanov Ognyan***Medical Doctor, Philosophy Doctor, Chief assistant
Ruse University "Angel Kanchev", Ruse, Bulgaria***Nedeva Teodora***Medical Doctor, Philosophy Doctor, Associate professor
Ruse University "Angel Kanchev", Ruse, Bulgaria*

"The effect of exercising could replace any medication but no medication in the world could replace exercising"

*Francois Tissot***SUMMARY**

Physical activity is one of the factors affecting all systems in the human body. Under the influence of regular physical activity the cardiac and respiratory activity becomes more effective and easy going. The metabolism changes by increase of the power output and thus healthy body weight is maintained. The regular physical activity improves the muscle power, the bone and the tendon strength. People who maintain high physical activity have more cheerful mood and improved self esteem and suffer less from depressive disorders. The physical activity is characterized by qualitative and quantitative parameters. One of the easiest methods of measuring the physical work capacity and the general functional condition of the cardiovascular system is the Harvard step test, which provides information about one's general physical condition and about the functional abilities of their organism, thus about the overall endurance and work ability of the tested person. Purpose: To be assessed the relationship between the physical activity and the heart rate recovery and between the physical activity and the physical work capacity /good health/. Subject of the study: Students from Public Health and Health Care Department at "Angel Kanchev" University of Ruse. Methodology of the study: The study is carried out using the Harvard step test in the period 1 March 2017 – 30 April 2017 with 68 students – kinesiotherapists, divided into two groups – A and B; group A includes students with high physical activity /dancing, fitness, football, volleyball, athletics/; group B includes respondents with low physical activity. Conclusions: the respondents with high physical activity /group A/ have good physical work capacity; the functional condition of the cardiovascular system of the respondents from group A is characterized by good indicators, the criteria of which are quick recovery of the increased heart rate after the physical activity and high values of FIS; the respondents with low physical activity /group B/ have bad physical work capacity: the endurance is lower; the heart rate returns to resting slowly and the exhaustion goes away slowly; low values of FIS. The above described conclusions show that there is a relationship between the physical activity and the physical work capacity and health.

Key words: functional tests, Harvard step test, physical activity, physical work capacity.

**ВЛИЯНИЕ ФИЗИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ НА ВОЗМОЖНОСТЬ
ФИЗИЧЕСКОЙ РАБОТЫ И ФУНКЦИОНАЛЬНОЕ СОСТОЯНИЕ СЕРДЕЧНО-
СОСУДИСТОЙ СИСТЕМЫ**

Захариева Кристина*Биолог, доктор по педагогике, доцент
Русенский университет "Ангел Кънчев", Русе, Болгария***Шербанов Огнян***Врач, доктор по медицине, главнии асистент
Русенский университет "Ангел Кънчев", Русе, Болгария***Недева Теодора***Врач, доктор по медицине, доцент
Русенский университет "Ангел Кънчев", Русе, Болгария*

*„Двигательная активность может заменить каждый препарат, но все лекарства в мире не могут
заменить движение “*

Франсуа Тиссо

Аннотация:

Физическая активность является одним из факторов, влияющих на все системы в организме человека. Под воздействием регулярной физической активности сердечная и дыхательная активность становятся более эффективными и легкими. Изменение метаболизма за счет увеличения выходной мощности и, следовательно, здоровой массы тела сохраняется. Регулярная физическая активность улучшает мышечную силу, силу кости и сухожилия. Люди, которые поддерживают высокую физическую активность, имеют более веселое настроение и улучшают самооценку и меньше страдают от депрессивных расстройств. Физическая активность характеризуется качественными и количественными параметрами. Одним из самых простых методов измерения физической работоспособности и общего функционального состояния сердечно-сосудистой системы является пошаговое испытание Гарварда, в котором представлена информация об общем физическом состоянии и функциональных способностях их организма, при этом об общей выносливости и работе способность испытуемого. Цель: Оценить взаимосвязь между физической активностью и восстановлением сердечного ритма, а также между физической активностью и физической работоспособностью / хорошим здоровьем. Тема исследования: Студенты отдела общественного здравоохранения и здравоохранения в Университете Русе «Ангел Канчев». Методология исследования: Исследование проводится с использованием тестового теста Гарварда в период с 1 марта 2017 года по 30 апреля 2017 года с 68 студентами - кинезитерапевтами, разделенными на две группы - А и В; группа А включает студентов с высокой физической активностью / танцами, фитнесом, футболом, волейболом, легкой атлетикой /; группа В включает респондентов с низкой физической активностью. Выводы: респонденты с высокой физической активностью / группа А / имеют хорошую физическую работоспособность; функциональное состояние сердечно-сосудистой системы респондентов из группы А характеризуется хорошими показателями, критериями которых являются быстрое восстановление сердечного ритма после физической активности и высоких значений ФИС; респонденты с низкой физической активностью / группа В / имеют плохую физическую работоспособность: выносливость ниже; сердечный ритм возвращается к медленному отдыху, и истощение медленно уходит; низкие значения FIS. Вышеприведенные выводы показывают, что существует взаимосвязь между физической активностью и физической работоспособностью и здоровьем.

Ключевые слова: функциональные тесты, шаговой тест Гарварда, физическая активность, физическая работоспособность

INTRODUCTION

“Exercise is health and health is life” – there is hardly anyone who would doubt this maxim, as it is no chance that the human body is constructed and adapted to move, it is “equipped” with complicated and strong motor system and all organs and organ systems are influenced by the physical activity [1].

The physical activity is one of the factors affecting all systems in the human body. Physical activity means any activity involving muscle power in order to be performed a movement, not just sport activities. Depending on the intensity and regularity all organs and organ systems change more or less. Under the influence of regular physical activity the cardiac and respiratory activity becomes more effective and easy going. The metabolism changes by increase of the power output and thus healthy body weight is maintained. The regular physical activity improves the muscle power, the bone and the tendon strength. People who maintain high physical activity have more cheerful mood and improved self esteem and suffer less from depressive disorders. One of the main causes of the socially significant diseases is the reduced physical activity of the modern man. The benefits of the regular physical activity for the human body are as follows: it stimulates the growth and strength of the bones; it increases the skeletal muscle mass; it improves the blood circulation; it reduces the heart rate and the blood pressure; it increases the vital capacity of the lungs, it stimulates the hemopoiesis; it improves the thinking skills, the memory, the attention, the mental capacity, the self esteem and the mood; it activates the metabolic pathways; it boosts the immune system [2]. The physical activity

is characterized by qualitative and quantitative parameters. The totality of all movements performed during the physical activity process represents its quantitative side, and the muscular efforts made per unit of time represent its quality (intensity). The terms hypokinesia and hypodynamia are used in the scientific literature and in the practice. The term hypokinesia means an abnormally decreased muscular movement whereby the movement amplitude and frequency is reduced. The term hypodynamia is a decrease in the strength of the motor system (the intensity is low) [1].

PRESENTATION

One of the easiest methods of measuring the physical work capacity and the general functional condition of the cardiovascular system is the Harvard step test which is a functional non-specific test. The Physical Work Capacity is one’s general ability to perform a certain physical activity and includes various limiting factors such as anatomical characteristics, efficiency and energy generation, the abilities of the cardiovascular system, strength and endurance of the muscles, neuromuscular coordination and others. The Harvard step test is an indirect testing method which provides information about one’s general physical condition and about the functional abilities of their organism, thus about the overall endurance and work ability of the tested person. The test is easily performed and is used not only to test athletes but to study the physical fitness of anyone. The Harvard step test is developed in the Harvard Fatigue Laboratory under the leadership of Dill / 1936. The exercise used is stepping up and down on a step/platform with a rate of 30 times per minute

which must be sustained for five minutes. The height of the platform and the duration of the exercise depend on the individual characteristics of the tested person: sex, age, height. For women the platform is usually 42 cm high, for men 50 cm high, for persons who do not exercise 30 cm high. For children and adolescents the platform is not that high and the exercise must be sustained for three minutes. If exhaustion occurs during the performance of the test and the tested person cannot hold on to the speed of the metronome, the exercise must be

discontinued and the time count is in seconds to the moment of discontinuation of the test. If the tested person keeps up the pace, the duration of the test must not exceed 5 minutes. Each stepping up and down is performed within four beats. The use of metronome is convenient as the metronome must be set to 120 beats per minute. During the test the tested person must be calm physically and emotionally and must keep the rhythm of stepping up and down the platform.



Physical exercise during the Harvard step test

On completion of the physical exercise, the tested person must sit down and their heart rate /HR/ is measured for 30" at certain intervals of time: HR₁: 60 - 90 sec; HR₂: 120 - 150 sec; HR₃: 180 - 210 sec. A Fitness

Index Score /FIS/ is calculated on the basis of the duration of the physical exercise and the heart rate. The value of this Fitness Index represents the functional condition of the cardiovascular system and the physical work capacity of the tested person. The Fitness Index is calculated using the following formula:

$$FIS = \frac{100xt(sec)}{2X(HR_1 + HR_2 + HR_3)}$$

where "t" is the time in seconds and the values of the heart rate HR₁, HR₂ and HR₃ during the first, the second and the third minute of the recovery. The resulting value is matched to the following data which corresponds to certain physical work capacity and functional condition of the cardiovascular system.

- over 96: excellent;
- 83 – 96: good;
- 68 – 82: satisfactory;
- 54 – 67: unsatisfactory;
- below 54: poor.

Due to the fact that the Harvard step test uses an index to calculate one's endurance, it is possible to compare the data from the testing of many people and to be made mathematical data processing. Thus various statistical studies and researches, assessing the physical and health condition of different groups of people can be made [5]. The Harvard step test /just like the Ruffier test/ is developed on the basis of the fact that when a physically fit person performs a certain activity the heart rate increases less compared to the heart rate of physically unfit people. Besides the heart rate of the

physically fit returns to resting more quickly due to the better adaptation mechanisms [3,4,5].

Performed test:

Purpose. To be assessed the relationship between the physical activity and the heart rate recovery and between the physical activity and the physical work capacity /good health/.

Subject of the study. Students from Public Health and Health Care Department at "Angel Kanchev" University of Ruse

Methodology of the study. The study was carried out using the **Harvard step test** in the period 1 March 2017 – 30 May 2017 with 68 students – kinesiotherapists, 20-27 years old, divided into two groups – A and B; group A includes students with high physical activity /dancing, fitness, football, volleyball, athletics/; group B includes respondents with low physical activity.

Results from the test. The results from the test are analyzed, summarized and visualized by histogram of figures 1, 2, 3 and 4.

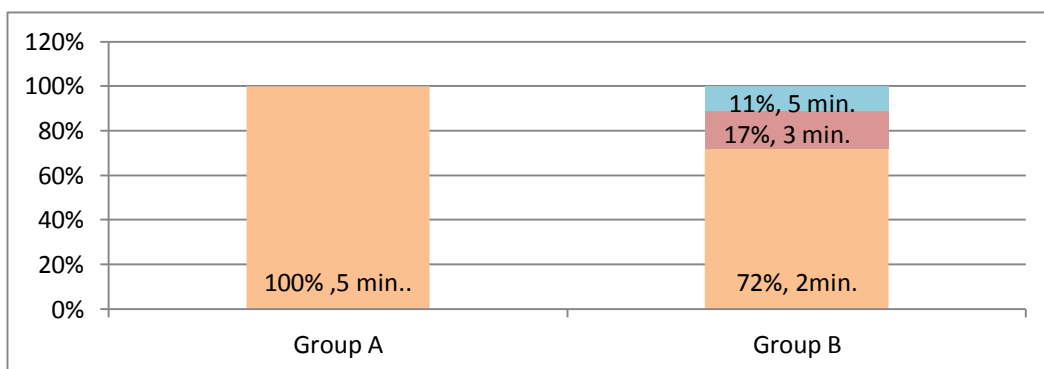


Figure 1. Duration of the exercise

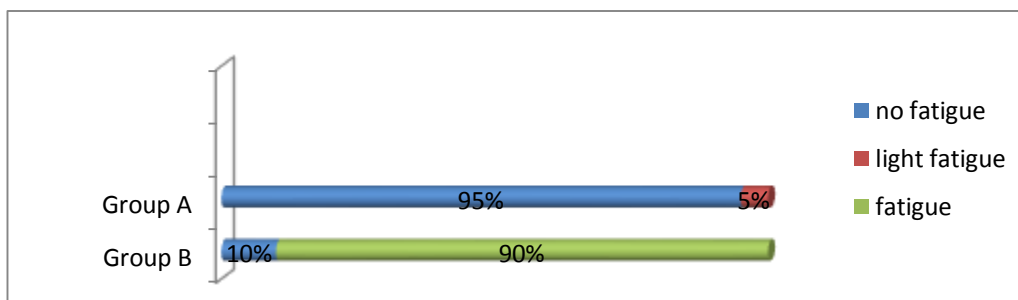


Figure 2. Complaints during the exercise

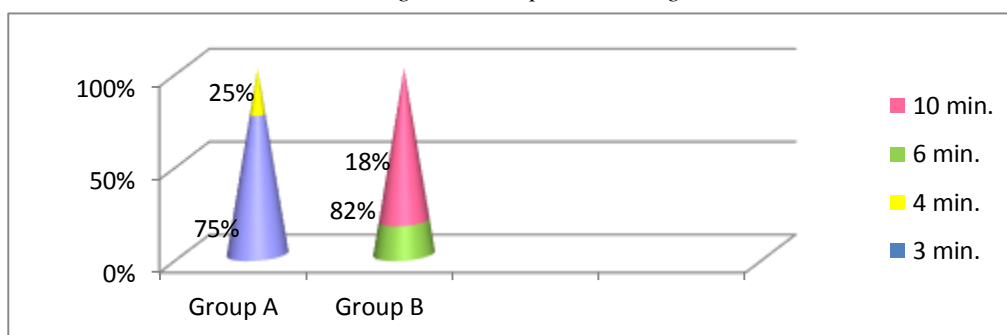


Figure 3. Recovery of the initial values of the heart rate after completion of the exercise

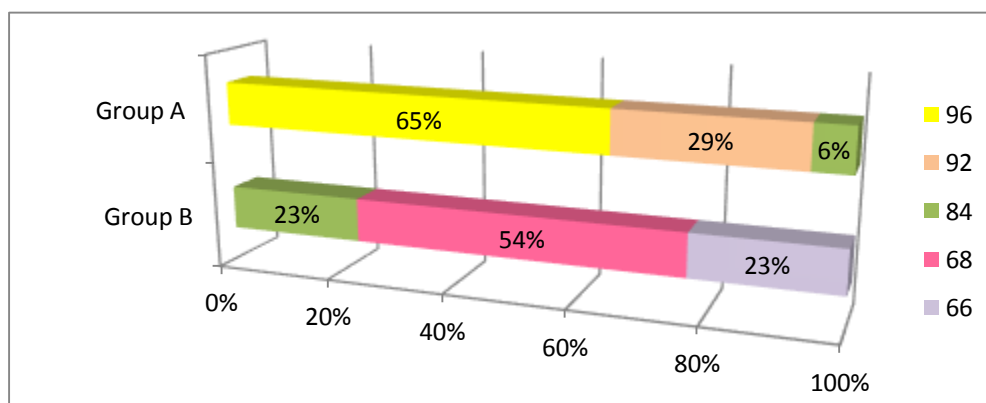


Figure 4. Value of FIS

The visualized results show that the physical activity of the respondents in the two /A and B/ groups affect their physical work capacity and functional condition of the cardiovascular system; respectively, in group A the physical work capacity is very good, while in group B the physical work capacity is satisfactory.

CONCLUSIONS:

The analysis of the performed test gives reasons for the following conclusions:

- the respondents with high physical activity /first group A/ have good physical work capacity;
- the functional condition of the cardiovascular system of the respondents in group A is characterized by good indicators, the criteria of which are quick recovery of the increased heart rate after the physical activity and high values of FIS;
- the respondents with low physical activity /group B/ have bad physical work capacity: the endurance is lower; the heart rate returns to resting slowly and the exhaustion goes away slowly; low values of FIS;

The above described conclusions show that there is a **relationship between the physical activity and the physical work capacity and health.**

There is no doubt that the lack of physical exercise has adverse effects on health, work capacity and life expectancy. That is why it is necessary everyone to be physically active and to choose physical activity which is a pleasure for them [1].

Reference:

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МАРКЕРЫ ЭНДОТЕЛИАЛЬНОЙ ДИСФУНКЦИИ И РЕГУЛЯЦИИ АНГИОГЕНЕЗА У ЖЕНЩИН С ФЕТО-ФЕТАЛЬНЫМ ТРАНСФУЗИОННЫМ СИНДРОМОМ В СОЧЕТАНИИ С СЕЛЕКТИВНОЙ ЗАДЕРЖКОЙ РОСТА РАЗВИТИЯ ПЛОДА ПРИ МОНОХОРИАЛЬНОЙ МНОГОПЛОДНОЙ БЕРЕМЕННОСТИ

Айттов Айтбек Эсенбекович¹,

д.м.н., проф.

Чистякова Гузель Нуховна,

к.м.н.

Ремизова Ирина Ивановна.

¹. *м.н.с. научного отделения лучевых и биофизических методов исследования
Федеральное государственное бюджетное учреждение «Уральский научно-исследовательский институт охраны материнства и младенчества» Министерства Здравоохранения Российской Федерации,
620028, Екатеринбург, Репина 1*

Аннотация

Цель исследования оценить показатели эндотелиальной дисфункции и маркеров регуляции ангиогенеза у 39 женщин с фето-фетальным трансфузионным синдромом в сочетании с селективной задержкой развития плода и без данных осложнений при монохориальной многоплодной беременности. Полученные результаты исследования позволяют предположить, что нарушение компенсаторно-приспособительных функций плаценты при монохориальной беременности, обусловленных дисбалансом продукции основных регуляторов ангиогенеза, связанных с дисфункцией эндотелия являются пусковым механизмом в реализации патологических состояний (фето-фетальный трансфузионный синдром, селективная задержка развития) при монохориальной беременности.

Annotation

The aim of the study was to evaluate endothelial dysfunction and markers of angiogenesis regulation in 39 women with twin-twin transfusion syndrome in combination with selective intrauterine growth restriction and without these complications in monochorionic multiple pregnancy. The results of the study suggest that the violation of compensatory-adaptive functions of the placenta in monochorionic pregnancy, caused by an imbalance in the production of the main regulators of angiogenesis associated with endothelial dysfunction, is the trigger mechanism for the realization of pathological conditions (twin-twin transfusion syndrome, selective intrauterine growth restriction) in monochorionic pregnancy.

Ключевые слова: про- и антиангиогенные факторы роста, эндотелин, фето-фетальный трансфузионный синдром, селективная задержка роста плода, монохориальная двойня.