

## HEALTH AND ITS DETERMINANTS

### CHAPTER I

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<sup>1</sup>Academy of Physical Education in Krakow, Poland  
Institute of Sport - Department of Sports and Recreational Games

<sup>1</sup>Akademia Wychowania Fizycznego w Krakowie  
Instytut Sportu - Zakład Gier Sportowych i Rekreacyjnych

<sup>2</sup>AGH University of Science and Technology, Faculty of Geology  
Geophysics and Environment Protection

Department of General Geology and Geotourism, Krakow, Poland

<sup>2</sup>AGH Akademia Górniczo-Hutnicza  
Katedra Geologii Ogólnej i Geoturystyki w Krakowie

<sup>3</sup>Academy of Physical Education nam. Jerzego Kukuczki in Katowice  
Cathedral Individual Sports

<sup>3</sup>Akademia Wychowania Fizycznego im. Jerzego Kukuczki w Katowicach  
Katedra Sportów Indywidualnych

<sup>4</sup>Academy of Physical Education in Krakow, Doctoral Studies

<sup>4</sup>Akademia Wychowania Fizycznego w Krakowie, Studia Doktoranckie

HENRYK DUDA<sup>1</sup>, PAWEŁ RÓŻYCKI<sup>2</sup>, LUCYNA STANEK<sup>1</sup>,  
ŁUCJA PŁATEK<sup>3</sup>, ALICJA STACHURA<sup>3</sup>, PAWEŁ KUBIENIEC<sup>4</sup>,  
MAGDALENA JASTRZĘBSKA<sup>4</sup>

### ***The influence of physical recreational activity for organism efficiency having regard to the state of the atmospheric air***

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### **Wpływ fizycznej aktywności rekreacyjnej na wydolność organizmu z uwzględnieniem stanu powietrza atmosferycznego**

Key words: recreational training, physical fitness, smog, monitoring

Słowa kluczowe: trening rekreacyjny, sprawność fizyczna, smog, monitoring

#### **INTRODUCTION**

The primary purpose of practicing physical activity in the forms of recreation is to improve the functioning of the human body in the aspects of its efficiency but also to improve his well-being, it is a physical and mental health. The term recreation ("rekreo") – is e revive, revitalize, strengthen, refresh, and re-create sets directions for the rational conduct in improving human health. Defining rational training recreational must agree with the above-mentioned definition, which comes from the same recreation and but it should also be clear that engaging in recreational physical

activity in a small way pay attention to the environmental conditions (eg. climate - air quality) in which takes place the same effort.

In this study the authors of the article pay attention to the aspect of the state of the air in which the training takes place recreation. Recently, this problem is discussed in detail. For it turns out that in many countries, especially in Poland in large urban areas we have to deal with a lot of air pollution, which far exceeds the standards safe for human life (Fig. 1). This condition has been called. "Smog", which for many cities in Poland is a big problem. The question then arises whether the training facility in a state of "smog" is a healthy the training?

### Rejony o najwyższym zanieczyszczeniu powietrza



**Fig. 1. The presence of dust pollution in the Polish [16]**

Clean air contains less than 80% nitrogen, less than 20% oxygen and 1% carbon dioxide and some of the other tracers. Although nitrogen serves only as a solvent for oxygen it is essential for the production of the protein in plants. Clean air is

*Henryk Duda, Paweł Różycki, Lucyna Stanek, Łucja Płatek, Alicja Stachura,  
Paweł Kubieniec, Magdalena Jastrzębska*

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vital to our health - it determines the correct metabolism of our body. The importance of oxygen for our health can be proved by the fact that you can survive a few days without food and water, but only a few minutes, we can survive without air [2]. Man has a body aerobic. We need air to live, and clean, fresh air to preserve the health [5]. Nowadays, we have big problems with clean air in big cities and industrial agglomerations [3], the fact that in a figurative presented in Fig. 2.



**Fig. 2. "Smog" industrial [14]**

The problems associated with increasing environmental pollution pose a serious threat to human health. Exposure to air pollution in combination with an unhealthy lifestyle contribute to the increase in incidence of lifestyle diseases, which include, for example, heart disease, diabetes, cancer, obesity, immune disorders. It can also affect problems associated with reproductive and mental health. Significantly increases the incidence of in children asthma and allergies. According to statistics of the World Health Organization (WHO) environmental burden of disease in Europe is responsible for almost 20% of all deaths [ 11]. With this in mind in the study of this work we attempt to illustrate the evaluation of response of the human body in training recreational conditions related to the state atmospheric air. These reactions are attempted to determine on the basis of physical efficiency, which largely depends on the oxygen absorption human organism.

Physical capacity is the ability of a heavy or long lasting physical exercises performed involving large muscle groups, without quickly growing of tiredness. Changes in the body that occur under the influence of physical activity (of tiredness)

cause changes in the internal environment of the body. Performance also includes changes in of fatigue tolerance and capacity for the rapid elimination of tiredness after the effort [5].

Actual measure of physical fitness is the duration of the efforts of a certain constant or increasing intensity, such as running, cycling (cycle ergometer) or a long walk under constant political equilibrium ("steady - stady").

The best known indicators of capacity is the ability to absorb oxygen through the body called. oxygen uptake (VO<sub>2</sub> max), also known as the aerobic capacity of the body. This indicator allows healthy people to predict the body's response to physical strain in a wide range of [6].

Physical capacity characterized by their ability to perform their efforts on the high energy cost in general, and not to perform specific types of efforts or activities. Man featuring high exercise capacity does not have to be characterized by higher than average efficiency of the locomotor system).

Physical capacity specify:

- 1) the efficiency function cooperating in meeting the oxygen demand of muscles and the activity of biochemical processes in the muscles which determine the use of aerobic energy sources,
- 2) the resources of energy substrates in muscle and other tissues and the efficiency of the mobilization of substrates from sources outside the muscle,
- 3) the efficiency of the processes of compensating changes in the internal environment of the body caused by the effort,
- 4) changes in of fatigue tolerance.

Also, the activities related to the practice of recreational activities in addition to the capacity should be in your assumption improve the strength of the body, which is closely related with exercise capacity.

So taking into account the above aspects of the performance essential for the health and fitness of the body, the studies have attempted to characterize the change (increase) efficiency parameters under the influence of regularly practicing recreational activity in an environment of fluctuating atmospheric air (better air quality).

For purposeful and rational training, recreation becomes necessary to identify and explore the functional capabilities of the body in response to the trainee Asked training load, determine the status of its current adaptive mechanisms, comprehensively responsible for the orders to the effort [4]. We are thinking of control in terms of physical capacity, and therefore an assessment of the ability of the body to perform a particular type of physical work, expressed the level of maximum exertion possibilities and efficient course of renewal processes [6]. Clarification of the mechanisms being available recreational exercise training is important because often the traditional control proceedings this matter is erroneously and superficially treated (not taken into account the conditions under which passes physical - eg. the conditions of "smog" in the environment). This problem is very important, because the current global environmental pollution in the world rises to the level of risk of

*Henryk Duda, Paweł Różycki, Lucyna Stanek, Łucja Płatek, Alicja Stachura,  
Paweł Kubieniec, Magdalena Jastrzębska*

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AIDS or Ebola [12]. This problem is significant not always taken into account in the aspects of health - recreational training.

Commonly understood health training is understood as an effort by optimum physical load, but generally do not take into account the state of the terrain - the state of the atmospheric environment. Having regard to those problems in the study evaluated response of the human body, not only on the level of training load but also the body's response to changing conditions because of the state atmospheric air.

### **PURPOSE OF RESEARCH, QUESTIONS AND HYPOTHESES**

The aim of the research is to try to control the process of rational action in the field of recreation for the improvement of human health, and to show the control process in the context of the assessment of physical fitness for the recreational needs (control methods) and for the needs of individual participants in the control of recreational training.

To specify the level of physical fitness will be important answers to basic questions:

1. To what extent will increase the rate of physical fitness training recreational participants underwent training stimuli.
2. Is the growth dynamics of the level of exercise possibilities of the human body may be dependent on the external environment (atmospheric pollution of the environment).

Taking into account the main objectives training recreation - defined hypotheses:

1. Under the influence of organized training recreation will increase the value of normative indicators of performance and endurance of the body
2. Increase performance indicators of the body depends not only on regular training and recreational but also the external conditions in which the training takes place.

### **MATERIAL AND METHODS**

The research was conducted among 15 in males in subgroups in age from 15 to 55 years, regularly in the years 2011- 2016.

These individuals have participated in organized recreational training (recreational off-road racing). They were individuals, who at that time did not cultivate other recreational physical activity. Activity speed they chose freely as weekly training recreation, with the belief that regular exercise will increase their fitness and improve physical health. Training recreational and research carried out in monthly cycles of training, so-called. 2 environments - specific because of the state of air (air quality). First environment - a City Park in Krakow - with high air pollution [7, 14] – fig. 1. Second environment - is a Radawa Resort in the Carpathian region. It is located in the "Forests Sieniawskich" the flood of water and river Lubaczówka. It is surrounded by forests, mostly coniferous, which has a microclimate healthy iodine

air [17] – fig. 1. The training microcycle (weekly) used three recreational training during 70 min. The training are used in these warm-up, a main portion method continuous and interrupted in the formation strength (load adapted to the requirement of forming the strength of the overall [5] - distance of the run of 3800 m., And the end portion: corrective exercises and stretching. The training period so. Test was carried out 24 units in training recreation. Recreational training program was conducted for the participants in a uniform way: one month in Krakow (12 units): May - June and one month in Radawie (12 units): July - August. To find out how stress mechanisms are influenced by the same physical loads but in changing environmental conditions (cleanness of the air), applied the test of endurance and strength tests overall body - Cooper test: continuous run time 12 min [10]. This test was carried out always 4 days before and 4 days after the completion of the cycle (one month) the recreational training. To a greater extent to assess the condition of the body's response to physical activity of the subjects, assessed by a subjective reaction test Borg [8], this test was used immediately after the test Cooper. In order to develop the test results were used basic statistical calculations: arithmetic mean standard deviation and Student's t-test, which determined the level of significance of differences. To determine the relationship between the measured characteristics were examined using Pearson's correlation coefficient [1].

### PRESENTATION OF RESEARCH RESULTS

When evaluating research performance strength and endurance of individuals involved in organized recreational training (tab.1-2) we can see a clear improvement.

**Tab. 1. The parameters of strength and endurance of the subjects recreational boating training in Krakow**

Nr. Research	Cooper test - Krakow I study (m)	Cooper test - Krakow II study (m)
The parameter value		
Arithmetic average	2711,00	2726,00
The average standard deviation	133,14	133,63
The coefficient of variation	4,91	4,90
The significance of differences	0,380	

**Tab. 2. Assessment of the subjective level of fatigue test Borg for 1 and 2 studies Cooper test - a study in Krakow**

Nr. Research	Tiredness - the scale of Borg Krakow 1 testing (point)	Tiredness - the scale of Borg Krakow 2 testing (point)
The parameter value		
Arithmetic average	17,33	16,73
The average standard deviation	0,72	0,80
The coefficient of variation	4,18	4,77
The significance of differences	0,20	

The analysis of the test results presented in the above tables we can see that both the strength parameters and such cardiovascular (vs. test at the beginning of the recreational training) showed changes. However, statistical analysis showed no significant differences [1]. Interesting results can already be seen in the comparative analysis of the results of the endurance test (Cooper test) to compare the environmental Krakow (II testing) and the environment with better air quality Radawa (I testing). It can be seen that the test assay but Cooper showed no differentiation significance level - did show a higher value results in meters (Tab. 3).

**Tab. 3. The value of the parameters of strength and endurance of the subjects recreational boating training in Krakow (II testing) and Radawa (I testing)**

The parameter value \ Nr. Research	Cooper test II testing Krakow (m)	Cooper test I testing Radawa (m)
Arithmetic average	2726,00	2748,00
The average standard deviation	133,63	132,38
The coefficient of variation	4,90	4,82
The significance of differences	0,327	

Interesting results can be seen already in the perception of subjective of fatigue (Borg scale). From the analysis of the results contained in Table 4 may be noted that the values obtained for the subjective sensation showed significant changes ( $p < 0.01$ ), you can therefore be considered that the training facility in better weather conditions showed less fatigue subjective trainees recreation.

**Tab. 4. Evaluation of the subjective level of tiredness test Borg for 1 studies test Cooper in Krakow and Radawa**

The parameter value \ Nr. Research	Tiredness - the scale of Borg Krakow 1 testing (point)	Tiredness - the scale of Borg Radawa 1 testing (point)
Arithmetic average	16,73	15,80
The average standard deviation	0,80	1,08
The coefficient of variation	5,82	6,76
The significance of differences	0,006**	

In further proceedings, the research attempted to determine progress in the development of strength as a result of measurable Cooper test for recreational training conducted in Radawa (better weather conditions). From the analysis of the data contained in Table 5 can be seen significant progress for your distance. The results for the I and II of the study showed differences at  $p < 0.05$ .

**Tab. 5. The value of the parameters of strength and endurance of the subjects recreational training in Radawa for I and II tests**

Nr. Research	Cooper test I testing Radawa (m)	Cooper test II testing Radawa (m)
The parameter value		
Arithmetic average	2748,00	2831,00
The average standard deviation	132,38	118,19
The coefficient of variation	4,82	4,17
The significance of differences	0,040*	

The positive effect of recreational training in Radawa can also be determined on the basis of subjective feelings (Borg Scale) - we see significant differences ( $p < 0.001$ ) in the subjective feeling of tiredness more favorable to the better climatic conditions (table 6).

**Tab. 6. Evaluation of the subjective level of tiredness test Borg for 1 and 2 studies test Cooper Radawa**

Nr. Research	Tiredness - the scale of Borg Radawa 1 testing (point)	Tiredness - the scale of Borg Radawa 2 testing (point)
The parameter value		
Arithmetic average	14,27	13,00
The average standard deviation	0,80	0,85
The coefficient of variation	5,60	6,50
The significance of differences	0,001***	

Confirming the status of the body's response recreational training in adverse conditions, the state of the air can also be seen by analyzing the results of measurable values Cooper test (test after returning to Krakow) - tab. 7. In these studies, admittedly no statistically significant differences were obtained for the results of strength but already we have seen worse value just run distance.

**Tab. 7. The parameters of strength and endurance of the subjects training for recreational Radawa II tests and in Krakow for III tests**

Nr. Research	Cooper test II testing Radawa (m)	Cooper test III testing Krakow (m)
The parameter value		
Arithmetic average	2831,00	2819,00
The average standard deviation	118,19	122,16
The coefficient of variation	4,17	4,33
The significance of differences	0,393	

Also in the subjective feeling of tiredness negative state to exercise could be noted for the effort in worse weather conditions - fatigue test Cooper in Krakow was significant than previously Radawa ( $p < 0.01$ ) - tab. 8.



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**Tab. 8. Evaluation of the subjective level of tiredness test Borg for the 2 studies test Cooper Radawa and 3 tests in Krakow**

Nr. Research	Tiredness - the scale of Borg Radawa 2 testing (point)	Tiredness - the scale of Borg Krakow 3 testing (point)
The parameter value		
Arithmetic average	13,00	13,87
The average standard deviation	0,85	0,83
The coefficient of variation	6,50	6,01
The significance of differences	0,004**	

## DISCUSSION

In the design of studies have tried to respond to physical recreational activity and the importance of this activity to improve overall physical condition. Recreational activity is closely associated with leisure time which is considered as a part of their time released (ex. also dispositions) of their professional, family and social, and devoted to their chosen activities for relaxation, entertainment and shaping their personality. Taking into account the objectives that are placed in front of recreational motor and the accompanying phenomenon of free time, which should rationally organize - especially when it comes to physical activity. So the problems of the research was underlined factor optimum effort (recreational running) and the impact of this form of physical activity on physical fitness. Speaking about the optimum load should be noted that the load will not only depend on the volume and intensity of training, but also on the conditions of atmospheric environment in which physical training runs. Often we make recreational activities in dusty environments, in terms of urban smog or industrial, which is a major health threat. Such forms of recreational activity does not meet the standards of healthy - they are even harmful to health. The condition for recreational boating training is to increase efficiency. Research has shown that this parameter stood at training recreation not only under the influence of optimal volume and training intensity recreational but also under the conditions of atmospheric environment. Human with greater functional capacity can better - economically operate. It is more productive, and its status determines health. Finding so measures to increase the efficiency of the body moving in the direction of rational activities that bring measurable benefits at work and, above all, improve human health.

As is clear from the research training recreation rational must take into account not only the optimum - the individual load but especially suitable climatic conditions (clean air). This aspect is often go unnoticed by trainees, hence it is often in conditions of big cities - with high smog can meet people training. Such conditions do not have a beneficial effect on human health, on the contrary - they are harmful to health, because, along with increased effort, followed by increased absorption of toxic substances from the air (atmospheric smog).

In this situation, the only directive: physical effort in conditions of atmospheric smog is prohibited. Such phenomena has been observed in a significant way in our research - where worse and worse being observed during exercise for more polluted air. The only alternative for recreational activity in conditions of urban smog is the use of masks - effectively filter polluted air (Fig. 3).



**Fig. 3. User mask RZ [15]**

Aspect of the physical in conditions of urban smog and industrial is very important for health. In Poland, more and more is said about it but the participants of physical activity in our country must also know the areas that currently pose the greatest threat from air pollution, in our country (see fig. 1).

In conclusion it should be noted that the rational training should not intensively affect the body's training, hence the rating on the example of the same strength training, recreational participants (often used in traditional training) may be misleading. Taking into account the body's response to load (such cardiovascular trials) under a specific environment (air quality in the region) are the reservoir before large load, thereby defining the direction of individual and common training in physical recreation.

### CONCLUSIONS

1. Result in measurable process control training does not fully reflect the exercise capacity of the body.
2. Rationalization of exercise training must take into account the body's reaction to physical effort.

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3. Planning recreational training must not only take into account the methods and means but also the current state of the atmospheric environment (air pollution).

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### ABSTRACT

The article focuses on problems related to control of strain in training recreation. Shows that in the assessment exercise should take into account not only towards measurable physical tests but above all take into account the body's responses to questions load. It should be remembered that the physical load depends not only on the means and scope of the intensity of the exercise, it also depends on the state of the atmospheric environment (air pollution). Taking into account the body's response to load (such cardiovascular trials), taking into account the conditions in which the training takes place before the reservoir is too high loads. These reactions also determine the direction of rational training facilities.

### STRESZCZENIE

Artykuł porusza problemy związane z kontrolą zdolności wysiłkowych w treningu rekreacyjnym . Ukazuje iż w ocenie wysiłku fizycznego należy uwzględnić nie tylko stronę wymiarną w testach fizycznych ale przede wszystkim uwzględnić reakcje organizmu na zadane obciążenia. Należy pamiętać , że obciążenie fizyczne zależy nie tylko od stosowanych środków i zakresu intensywności wysiłkowej, zależy ono również od stanu środowiska atmosferycznego (zanieczyszczenie powietrza). Uwzględnienie reakcji organizmu na obciążenia (próby wydolnościowe) z uwzględnieniem warunków w jakich odbywa się trening są rezerwuarem przed obciążeniami forsującymi, wyznaczając tym samym kierunki racjonalnego treningu rekreacyjnego.

*Artykuł zawiera 24713 znaków ze spacjami + grafika*